

Chapter 3

AFFECTED ENVIRONMENT

3.0 INTRODUCTION

This chapter describes the affected environment, including the cultural, historical, social and economic conditions that could be affected by implementation of the alternatives described in Chapter 2. Aspects of the affected environments

described in this chapter focus on the relevant major issues presented in Chapter 2. Certain critical environmental components must be considered in all Environmental Assessments under BLM policy. These items are presented below in Table 3.0-1.

Table 3.0-1 Critical Elements Requiring Mandatory Evaluation

Mandatory Item	Not Present	No Impact	Potentially Impacted
Threatened and Endangered Species			X
Floodplains		X	
Wilderness Values	X		
ACECs	X		
Water Resources			X
Air Quality			X
Cultural or Historical Values			X
Prime or Unique Farmlands	X		
Wild & Scenic Rivers	X		
Wetland/Riparian		X	
Native American Religious Concerns			X
Hazardous Wastes or Solids		X	
Invasive, Nonnative Species			X
Environmental Justice		X	

3.1 AIR QUALITY

Under the Clean Air Act of 1970, EPA developed primary and secondary National Ambient Air Quality Standards (NAAQS) for each of the six criteria pollutants: carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide. These standards establish pollution levels in the United States that cannot legally be exceeded during a specified time period.

Primary standards are designed to protect human health, including "sensitive" populations, such as people with asthma and emphysema, children, and senior citizens. Primary standards are designed for the immediate protection of public health, with an adequate margin of safety.

Secondary standards are designed to protect

public welfare, including soils, water, crops, vegetation, buildings, property, animals, wildlife, weather, visibility and other economic, aesthetic, and ecological values, as well as personal comfort and well-being. Secondary standards were established to protect the public from known or anticipated effects of air pollution.

Montana has adopted additional state air quality standards that are at least as stringent as the NAAQS. These Montana Ambient Air Quality Standards (MAAQS) establish statewide targets for acceptable amounts of ambient air pollutants to protect human health. NAAQS and MAAQS establish upper limits for concentrations of specific air pollutants. Table 3.1-1 summarizes the NAAQS and MAAQS.

Table 3.1-1 National and Montana Ambient Air Quality Standards

Pollutant	Time Period	Federal (NAAQS)	Montana (MAAQS)
Carbon Monoxide	Hourly Average	35 ppm ^a	23 ppm ^a
	8-Hour Average	9 ppm ^a	9 ppm ^a
Fluoride in Forage	Monthly Average		50 µg/g ^b
	Grazing Season		35 µg/g ^b
Hydrogen Sulfide	Hourly Average		0.05 ppm ^a
Lead	90-Day Average		1.5 µg/m ³ ^b (rolling)
	Quarterly Average	1.5 µg/m ³ ^b (calendar)	
Nitrogen Dioxide	Hourly Average		0.30 ppm ^a
	Annual Average	0.053 µg/m ³	0.05 ppm ^b
Ozone	Hourly Average	0.12 ppm ^c	0.10 ppm ^a
PM-10 (existing)	24-Hour Average	150 µg/m ³ ^{dj}	150 µg/m ³ ^{dj}
	Annual Average	50 µg/m ³ ^e	50 µg/m ³ ^e
PM-10 (revised)	24-Hour Average	150 µg/m ³ ^{fj}	
	Annual Average	50 µg/m ³ ^e	
PM-2.5	24-Hour Average	65 µg/m ³ ^{g,j}	
	Annual Average	15 µg/m ³ ^h	
Settleable Particulate	30-Day Average		10 g/m ² ^b
Sulfur Dioxide	Hourly Average		0.50 ppm
	3-Hour Average	0.50 ppm ^k	
	24-Hour Average	0.14 ppm ^{j,k}	0.10 ppm ^{a,j}
	Annual Average	0.03 ppm ^k	0.02 ppm ^k
Visibility	Annual Average		3 X 10 ⁻⁵ /m ^k

Source: http://www.deq.state.mt.us/AirQuality/Planning/Air_Standards/AIR_STANDARDS.pdf

a. Federal violation when exceeded more than once per calendar year.

b. Not to be exceeded (ever) for the averaging time period as described in the regulation.

c. Not to be exceeded more than once per year averaged over 3-years.

d. Violation occurs when the expected number of days per calendar year with a 24-hour average above this concentration is more than one.

e. Violation occurs when the expected annual arithmetic mean concentration is above this concentration.

f. To attain this standard, the 99th percentile of the distribution of the 24-hour concentrations for one year, averaged over three years, must not exceed this concentration at each monitor within an area.

g. To attain this standard, the 98th percentile of the distribution of the 24-hour concentrations for one year, averaged over three years, must not exceed this concentration at each monitor within an area.

h. To attain this standard, the 3-year average of the annual arithmetic mean of the 24-hour concentrations from a single or multiple population oriented monitors must not exceed this concentration.

i. State violation when exceeded more than eighteen times in any 12 consecutive months.

j. The standard is based upon a calendar day (midnight to midnight).

The MDEQ under their EPA approved State Implementation Plan, is the primary air quality regulatory agency responsible for determining potential impacts from detailed development plans that exceed MAQP thresholds. The preferred alternative (alternative B), as well as Alternative A, are below the 25 ton per year MAQP threshold, except for NO_x emissions from the drill rig stationary engine. However, ARM 17.8.744(1)(i) exempts drill rigs that have the potential to emit less than 100 tons per year and that do not operate in the same location for more

than 12 months from the need to obtain a MAQP. Therefore, a MAQP permit would not be required. Further development of the proposed project (compressor stations, etc.) that exceeds the MAQP threshold would be subject to applicable air quality laws, regulations, standards, control measures and management practices. Therefore, MDEQ has the ultimate responsibility for reviewing and permitting the project prior to further development if the future project exceeds MAQP thresholds. Any MDEQ air quality permitting would be based on site-

specific, detailed engineering values, which would be assessed in the permit application review.

Incremental increases in the ambient concentration of criteria pollutants are regulated under the New Source Review - Prevention of Significant Deterioration (PSD) program. The program is designed to limit the incremental increase of specific air pollutants from major sources of air pollution above a legally defined baseline level, depending on the classification of a location. Incremental increases in PSD Class I areas are strictly limited, while increases allowed in Class II areas are less strict. The project area and surrounding areas are classified as PSD Class II. The closest PSD Class I area, the Northern Cheyenne Indian Reservation, lies approximately 25 miles northeast of the project. The project area and adjacent areas are identified as PSD Class II, where incremental increases are not as restrictive when compared with the incremental increases allowed in PSD Class I areas.

The proposed project's potential to emit any regulated air pollutant is well below the PSD threshold of 250 tons per year for non-listed sources and the proposed project is not a listed source. Therefore, PSD does not apply to the proposed project. In addition, the PSD minor source baseline date has not been triggered for any regulated pollutant in the proposed project because there are no PSD sources that significantly impact the proposed project area. Therefore, a PSD increment consumption analysis is not required for the proposed project because the proposed project would not consume increment. Furthermore, ARM 17.8.807 exempts concentrations of oxides of sulfur (SO_x), particulate matter (TSP), or NO_x emitted from stationary sources attributable to the temporary increase in emissions from consuming increment if the time period for the temporary increase in emissions does not exceed 2 years, does not impact a Class I area or an area where an applicable increment is known to be violated, and does not contribute to a violation of the NAAQS.

Although the proposed project is not subject to PSD, existing field compressor sites (CX24 Battery (MAQP #3036), CX25 Battery (MAQP #3037), CX19 Battery (MAQP #3118), CX35 Battery (MAQP #3122), and CX14 Battery (MAQP #3141), and an existing sales battery,

(Symons Central Compressor Station (MAQP #3250-00) that would be used to process the CBNG from the proposed wells have received MAQPs from the MDEQ.

MDEQ requires all ambient air quality modeling to demonstrate compliance with the MAAQS/NAAQS for all CBNG compressor stations. In addition, MDEQ requires that the modeling include a NO_x PSD increment analysis to demonstrate compliance with the Class I NO_x increment and the Class II NO_x increment, regardless of whether or not PSD applies to the facility. A New Source Review – PSD increment analysis is not normally required for CBNG sources. However, as a result of the potential for levels of CBNG development projected in the MT FEIS, the MDEQ determined that CBNG compressor stations must meet PSD increments for NO_x . The MDEQ has found that the NO_x emissions are the limiting pollutant from compressor stations because such emissions are the most likely pollutant to violate any ambient air quality standard or increment. Modeling for NO_x for the nearby Badger Hills Project Plan of Development, was completed in 2004. The model factored in all past, current and foreseeable future development within a 20 km radius of the CX35 battery, including emissions from the existing field compressors used for the Dry Creek POD gas processing and the Symons Central Compressor.

At the request of the BLM for the Badger Hills POD, the Montana Department of Environmental Quality (MDEQ) reviewed nitric oxide and nitrogen dioxide (NO_x) modeled emissions from all the known CBNG compressor stations in Montana, the Spring Creek and Decker Mines, and the known Wyoming Sources of CBNG development within 20 kilometers of an area near the center (Seven Brothers 35 Battery) of the project area. Analyzed sources and results are grouped by the Montana Sources, Wyoming Sources and All Sources combined (see the Badger Hills EA, Air Quality Technical Report for more details about the modeling completed for the EA). Emission sources include existing, proposed and reasonably foreseeable sources where exact locations and critical analysis parameters are known. The model was prepared for the Badger Hills EA, Alternative B, because the number of compressors would not vary by more than two 400 hp compressors across all the alternatives for direct and indirect impacts, and six 400 hp compressors for cumulative impacts,

and Alternative B included the most compressors under consideration.

As a result of the Badger Hills modeling, annual total NO₂ cumulative concentrations in the project area are well below Montana and federal air quality standards (MAAQS, NAAQS). Total concentrations from coal bed natural gas operations in Montana and Wyoming and coal operations at the Spring Creek and Decker Mines are less than 32% of applicable ambient air quality standards.

One hour total NO₂ cumulative concentrations in the project area are in compliance with applicable MAAQS and NAAQS. Total concentrations from coal bed natural gas operations in Montana and Wyoming and coal operations at the Spring Creek and Decker Mines are less than 60% of applicable ambient air quality standards.

Modeled NO₂ cumulative concentrations in the Northern Cheyenne Reservation are 21% of the PSD Class I increment. Modeled NO₂ cumulative concentrations in the project area are 90% of the PSD Class II increment.

Based on the modeling completed for the MT and WY FEIS's, and the results of the cumulative impact modeling for the Badger Hills EA, the impacts would be in compliance with all of the air quality standards and PSD increments and thresholds for the pollutant impact indicators for mandatory federal Class I PSD areas and sensitive lakes.

3.2 CULTURAL RESOURCES

3.2.1 Cultural Resources

BLM's 8100 Manual defines cultural resources as "a definite location of human activity, occupation, or use identifiable through field inventory (survey), historical documentation, or oral evidence. This includes archaeological, historic, or architectural sites, structures, or places with important public and scientific uses, and may include definite locations (sites or places) of traditional cultural or religious importance to specified social and/or cultural groups".

The Area of Potential Effect (APE) for cultural resources was determined to be specific components of the project that are considered part of the Proposed Action or Federal undertaking. These components included the

well sites, the various corridors and ancillary support facilities, the water system and the overhead powerline right-of-way authorized by BLM.

As a result, it was determined that the location of specific components of the federal undertaking and the areas immediately adjacent to those components would be subject to direct impacts from the proposed activities. This area was initially determined to be within the Area of Potential Effect. Consequently, an identification strategy was developed to identify sites within the direct impact area. This was determined to be a 10 acre survey area centered around each of the proposed federal well sites and a 400 foot wide survey corridor for the linear corridor facilities. The area of indirect impact was determined to be the entire project area, which includes all the area within the POD boundary. In the final analysis, the entire project area was determined to be within the APE, and the APE, for cultural resources analysis purposes, is the entire project area, within the POD boundary, regardless of surface ownership.

Cultural Resource Inventories: BLM required the company to conduct cultural resource inventories of the Area of Potential Effect for all of the surface disturbing actions associated with this undertaking that might have the potential to affect cultural resources. Areas of high relief where CBNG development could or, would not likely occur, were excluded from the inventory areas. As a result, approximately 902 acres of the proposed project area within the POD boundary was inventoried for cultural resource values at the Class III level specifically for this Dry Creek POD, which represents about 14% of the approximately 6,560 acres (6,465.8) actual acres POD area and Area of Potential Effect.

The initial inventory and identification strategy employed for this project began by conducting 10-acre surveys around individual proposed well sites and 400-foot wide survey corridors for linear facilities. Subsequent project design changes by the company and changes necessitated by various resource concerns, resulted in additional addenda inventories that tended toward larger block surveys of the affected areas (see "Tongue River-Dry Creek: A Cultural Resources Investigation For Proposed Well Pads and Ancillary Facilities in Big Horn County, Montana", Pauley, John, et al 2003 and various addenda, Strait, James, et al 2004) (BLM

Cultural Resources Report MT-020-04-146). These inventories incorporate all 11 proposed federal well sites, the access roads, pipelines and buried powerlines in associated corridors, overhead powerline rights-of-way, as well as all of the proposed water pipeline system and outfall locations.

An additional inventory was also conducted within the Dry Creek project area and Area of Potential Effect as part of inventories conducted for an adjacent POD. This inventory consisted of surveys of large block areas (see “Fidelity: Cultural Resource Investigations of the Pond Creek Development Area in Big Horn County, Montana”, Strait, James and Lynelle Peterson 2004) (BLM Cultural Resources Report MT-020-04-443).

As a result of these subsequent inventories, approximately 1,109 additional acres were surveyed within the POD area. These surveys inventoried an additional 17% of the POD area for a total of 2,011 acres of recent inventory covering approximately 30% of the POD area and Area of Potential Effect.

Total area of disturbance affected by the Proposed Action (federal undertaking) would be approximately 317 acres or only 5% of the POD area and Area of Potential Effect. Results of the various Class III inventories and subsequent addendums, including a summation of the inventory efforts conducted to date for the Dry Creek POD, are on file at the Miles City Field Office.

Previous Archeological Investigations in the Dry Creek POD: BLM records and the State Historic Preservation Office Cultural Resource database indicate that a number of cultural resource inventories were undertaken in the project area dating back to the early 1970’s. The entire area of the Dry Creek POD has been previously inventoried for cultural resources at varying levels of survey intensity, none of which would meet today’s survey standards. The area has been inventoried at least once in the mid to late 1970’s to early 1980’s and in some places twice. These inventories were conducted for proposed coal mines. These inventories include: The Decker/Birney Archaeological Survey, Big Horn County, Montana (Leondrof 1972); Archaeological Survey at CX Decker (Gregg 1977); CX Project, 1980 (Gregg 1980); CX Ranch Project (Greiser 1980); Volume 14 CX

Ranch Project Cultural Resource Inventory (Volumes 1 & 2) (Newell, et al 1981); and Wolf Mountain Mine Surface Permit Application, Volume 2, Part 304(2); Cultural Resources (Heritage Research Associates 1982).

Site types previously recorded and identified in the area consist of lithic scatters, stone circle sites, cairns, rock shelters, rock art, burials, bison kills and historic sites related to the 19th and early 20th Century development of the area. Previous cultural resource and ethnographic projects have found several of these site types to be important to Native American groups with ties to the area (see Section 3.2.3 Traditional Cultural Values).

A number of sites were located by these inventories. Collectively, the coal mine inventories located some 89 cultural resource sites within the project and POD areas where the proposed undertaking would occur. The site types identified within the POD area include 73 lithic scatters, 2 stone ring sites, 2 petroglyph sites, 2 rock shelters, a hearth, a lookout and 8 historic sites, all of which are related either to the historic homestead period or to early coal mining (see BLM Cultural Resources Report: “A Summary of Cultural Resources and Issues in the Fidelity Exploration and Production Company’s Tongue River/Dry Creek POD, Big Horn County, Montana” (Hubbell 2004; MT-020-04-146, for additional details). The referenced Summary report is an extensive and comprehensive compilation of cultural resources information in and adjacent to the project area.

A review of the properties listed on the National Register of Historic Places reveals that the two closest properties to the POD area, which are listed on the National Register, are the Wolf Mountain Battlefield and the Lee Homestead. Neither site is located within the project area.

Findings: (Sites within the Dry Creek POD and Adjacent Sections): BLM required Fidelity to conduct cultural resource inventories of the area to be impacted by the various surface disturbing actions associated with the Proposed Action (federal undertaking). Class III cultural resource inventories were completed by Ethnoscience of Billings, Montana, for the specific portions of the project area consisting of those portions determined to be part of the federal undertaking. Results of these inventories are documented in the report entitled “Tongue River-Dry Creek:

Cultural Resources Investigations for Proposed Well Pads and Ancillary Facilities in Big Horn County, Montana” (Pauley, John, et al 2003) and various addendums.

Review of BLM cultural resource records shows that the Areas of Potential Effect for cultural resources for the various aspects of the proposed project area have been recently inventoried for cultural resource in 2003 and 2004 covering private surface, State of Montana administered lands and BLM administered public lands (see BLM Cultural Resources Report number: MT-020-04-146). Approximately 626 acres of Private surface, 201 acres of State surface and 75 acres of Federal surface, for a total of 902 acres, were inventoried specifically for this project.

As a result of these inventories, four sites (not previously recorded) were located within the Area of Potential Environmental Effect for this undertaking, sites 24BH2984 (lithic scatter), 2585 (lithic scatter), 2986 (lithic scatter) and 3069 (petroglyph). These four newly recorded sites along with the 89 previously recorded sites make for a total of 93 sites within the POD area and Area of Potential Environmental Effect.

Of these 93 sites within the POD area and Area of Potential Environmental Effect, twelve sites were determined to be within the Area of Potential Effect, and within or adjacent to the area of direct impact for the proposed facility developments where primary or direct impacts might occur. These sites include 24BH1030, 24BH1033, 24BH1957, 24BH1959, 24BH2095, 24BH2109, 24BH2117, 24BH2120, 24BH2173, 24BH2239, 24BH2986 and 24BH3162.

Of these 12 sites, sites 24BH1030, a lithic scatter and hearth site, 24BH1033, a lithic scatter and cairn site and 24BH1959, also a lithic scatter and cairn site, have been determined and are considered eligible for the National Register of Historic Places. Sites 24BH1957, a lithic scatter site, 24BH2239, also a lithic scatter site, and 24BH3162, an historic mining site, have been determined not eligible for the National Register, while sites 24BH2095, 24BH2109, 24BH2117, 24BH2120, 24BH2173, and 24BH2986, all lithic scatter sites, eligibility status remain undetermined at this time.

In addition, of the above 93 sites, three additional sites are located within the POD area and Area of Potential Environmental Effect, but

lie outside of the area of direct impact and are located within the area of indirect impact. These include sites 24BH1949, a lithic scatter site, 24BH1950, a lithic scatter and rock art site, and 24BH2125, the historic Powers Ranch. Each of these sites have been determined eligible for the National Register of Historic Places. Site 24BH2125, the Powers Ranch, was once listed on the National Register of Historic Places, but because the site has been demolished, the site has been de-listed. One additional site, 24BH2128, the CX Ranch, may be considered eligible for the National Register. At this time, its eligibility status remains undetermined.

Finally, a review of sites located and recorded in the Sections surrounding the Dry Creek POD area reveals that there are only two sites, site 24BH1001, a kill site, located in adjacent Section 31, T. 9 S., R.40 E and site 24BH1975, a lithic scatter site, located in adjacent Section 29, T. 9 S., R.40 E., that have been determined eligible for the National Register of Historic Places.

Cultural Landscapes: In addition to the National Register eligibility of individual sites, the project area was also examined for the presence of historic districts and an analysis was undertaken examining the Cultural Landscape. The Secretary of the Interior’s Guidelines for the Treatment of Cultural Landscapes lists several types of landscapes. These include historic sites, historic designed landscapes, ethnographic landscapes, and historic vernacular landscapes. Cultural landscapes are usually defined as those created through human action and intervention, as distinguished from the physical landscape which describes an area’s landforms.

A cultural landscape is defined as “a geographic area, including both cultural and natural resources (including the wildlife and domestic animals) associated with an historic event, activity or person or exhibiting other types of cultural or aesthetic values.” The term cultural landscape serves as an umbrella term that includes four general landscape types: historic designed landscapes, historic vernacular landscapes, historic sites or districts and ethnographic landscapes. All four of these types of landscapes may be considered for eligibility under National Historic Preservation Act.

Historic Districts: No historic districts exist within the POD area and none are proposed for

the area.

Historic Designed Landscapes: Historic Designed Landscapes are defined as a landscape that is “consciously designed or laid out by a landscape architect, master gardener, architect, engineer or horticulturalist according to design principles or an amateur gardener working in a recognized style or tradition.” (U.S. Department of Interior, National Park Service, National Register Bulletin 30 1990). Examination of the area reveals that there are no designed landscapes within the project area. The project area generally retains its original unmodified and rural character and there is no evidence for the presence of a planned, designed or developed landscape. However, it might be argued that the larger area surrounding the project area containing adjacent coal mines and recently developed coal bed natural gas development might be more accurately described as an “industrial landscape”.

Historic Vernacular Landscapes or Rural Historic Landscapes: A Rural Historic Landscape is defined as “a geographical area that historically has been used by people or shared or modified by human activity, occupancy or interventions and that possess a significant concentration, linkage or continuity of areas of land use, vegetation, buildings and structures, roads and waterways and natural features.” (US Dept of Interior, National Park Service, National Register Bulletin 30 1990). These landscapes also “result from historic use” (National Register Bulletin 30, US Dept of Interior, National Park Service 1990).

Although the project area is part of a rural environment that typifies southern Montana, the area around the POD, especially to the east of the project area, has been impacted by the introduction of modern features into the landscape, such as the Tongue River Dam and Reservoir and two coal mines. Despite these visual intrusions, there are areas in the region that are relatively unmodified. These areas reflect the farming, grazing and mining activities associated with the historic homestead period of southern Montana.

Tangible evidence of historic activities in the region, which incorporates the Dry Creek POD area, includes small communities, abandoned and occupied ranches, small wagon coal mines, irrigation ditches, fences and roads. However, in

general, the POD area and greater landscape of the area is not associated with specific significant historic events or persons. Therefore, there is no potential for a Rural Historic Landscape to be considered as eligible on its own under either Criteria A or B.

In 1981, a previous cultural resource inventory (Greiser and Newel 1981) conducted for a potential coal mine, conducted an extensive examination of the region that included the Dry Creek POD area. Greiser and Newel originally identified and recommended two historic homestead sites within the POD area, sites 24BH2125, the Powers Ranch, and site 24BH2128, the CX Ranch, as being eligible for the National Register. However, apparently, site 24BH2128, the CX Ranch, was never officially nominated or determined eligible and its eligibility status remains undetermined at this time.

Greiser and Newel’s study went on to identify and recommend site 24BH2125, the Powers Ranch, as eligible for the National Register under Criterion A, B and D. However, just because this may be one of the earliest ranches settled in the area, it does not necessarily make the site eligible. The site was also recommended as eligible under Criterion B, because of the association with the original owners, Archibald Craig, George Cormack and Oscar Cook. These people’s importance was more associated with other activities than ranching and this site. Therefore, the association of the site with these people does not necessarily make the site eligible under Criterion B, nor is the site considered eligible under Criterion C as the buildings do not display a unique architectural style as they are of wooden frame construction of a style common to the area and period.

Although this site is both eligible and listed on the National Register, there is no direct relationship or link between the site and features of the broader landscape and there is little evidence that the landscape contributed significantly to the importance of the site. Therefore, there is no potential for a Rural Historic Landscape to be considered as eligible in association with site 24BH2125 under either Criteria A, B or C.

Ethnographic Landscapes: Ethnographic Landscapes are landscapes that contain natural and cultural resources or elements that people

associate with features defined as heritage resources. Although these heritage resources may consist of tangible properties, the landscapes may also possess significant intangible qualities. These intangible qualities are more likely to be identified through ethnographic studies while in the course of conducting research and interviews. These intangible qualities may also be less easily recognized on the ground. The area has been utilized and occupied over the past 10,000 years, with tangible evidence of prehistoric occupation exhibited by the number of prehistoric sites, such as the numerous lithic scatter sites that demonstrate the utilization of the locally available rock sources.

One of the more recent significant events to have occurred in the region, however not within the Dry Creek POD project boundaries, were several skirmishes and battles, along with campsites and trail use through the area, as part of the Sioux War of 1876. The nearest battle site was the Tongue River Heights skirmish site, located on a height of land overlooking the Tongue River on the border of Wyoming and Montana located some three miles to the east of the project area primarily in Section 33, T., 9 S., R. 40 E. in Montana and in Section 23, T.58 N., R. 83 E. in Wyoming. Second, a campsite associated with the Sioux and Cheyenne, under the leadership of Crazy Horse and Two Moons, is located on the east side of the Tongue River near the mouth of Deer Creek on the Tongue River, outside of the POD area. In addition, some travel routes used by the combatants, both the military and Native Americans, to and from some of the local battles may have traversed through the POD area. However, the National Park Service has determined that the routes used during the Sioux War do not meet the criterion of significance through historic usage, as defined by the National Trails System Act. Although the area has been and is important for Native American cultures, there are no defining characteristics that define the area as an ethnographic landscape.

An ethnographic overview of Southeast Montana (Peterson and Deaver, 2002) was also conducted for the region containing the POD project area. The study identified water and a number of site types as culturally sensitive and also urged avoidance of all sites where possible. The Northern Cheyenne Tribal Document (NCT, 2002) also identified a number of site types as being culturally sensitive to the Tribe. These

include large stone ring sites, isolated fasting beds, rock art sites and large diameter fasting structures such as medicine wheels. Cultural resource inventories conducted to date in the region may have recorded some of these features of concern, such as burials, which may be marked by cairns, communal kills sites, eagle trapping pits, fasting beds, stone rings, petroglyphs or rock art, vision quest sites and environmental locations where plants, water or minerals are gathered, tipi rings, and cultural material scatters. However, these sites are not distributed across the POD area in a manner that would suggest an ethnographic landscape. The ethnographic study did not identify an ethnographic landscape or any Traditional Cultural Properties within the Dry Creek project area, nor did the cultural resource inventory of the POD area identify any such sites. In addition, through tribal consultation with the Northern Cheyenne Tribe and their Tribal Historic Preservation Officer, no areas of Traditional Cultural Properties were identified within the Dry Creek project area, nor did the Northern Cheyenne Tribe identify a specific cultural tie to the area which would suggest an ethnographic landscape.

Native American Consultation: The Northern Cheyenne and Crow Tribes, as well as numerous other Tribes in the region, were notified of this project by letter dated August 3, 2004. Certified letters were sent on August 3, 2004, to 15 Tribal Groups, essentially those that were on the contact list from the Ethnographic Overview of Southeast Montana. These letters were sent seeking Native American input on the project.

The August 3, 2004, letter requesting consultation was sent to the Northern Cheyenne Tribal Historic Preservation Officer (THPO), the Crow Cultural Commission, Fort Peck Tribes, Lower Brule Sioux Tribe, Rosebud Sioux Tribe, Pine Ridge Sioux, Cheyenne River Sioux, Eastern Shoshone Tribe, Standing Rock Sioux, Northern Arapahoe Tribe, Blackfeet Tribe, Ft. Belknap Community Council, Chippewa-Cree Tribe of the Rocky Boy's Reservation, Montana Preservation Alliance, and National Trust for Historic Preservation. A series of follow-up telephone calls were made on August 25 and 26, 2004, and on September 15, 2004, to the addressees on the mailing list. No formal responses were received from any of the groups and numerous phone calls to these groups were not returned. Contact was made only with

Gilbert Brady THPO of the Northern Cheyenne Tribe, George Reed (Crow Cultural Commission Chairman) of the Crow Tribe, Curly Youpee (Fort Peck Cultural Committee representative) of the Fort Peck Tribes and Tim Mentz (THPO) of the Standing Rock Sioux Tribe.

Tim Mentz of the Standing Rock Sioux Tribe had no comments to make, while Curly Youpee of the Fort Peck Tribes only wanted to set up consultation procedures so that the tribe could be kept abreast of CBM development activities. Attempts were made to set up a field tour with George Reed of the Crow Tribe, but due to illness he was unavailable and no one from the Cultural Commission office called back. The only successful consultation occurred with Gilbert Brady of the Northern Cheyenne Tribe.

The Northern Cheyenne Tribal Historic Preservation Officer was provided copies of the preliminary cultural reports on August 13 2004, followed by copies of addendum reports on September 2, 2004, at the time of the field tour. Adequacy of cultural resource inventories for identifying Traditional Cultural Properties was identified as an issue by the Northern Cheyenne Tribe in a meeting with BLM held in Miles City on October 20, 2003. Consequently, a field visit was conducted by the BLM and the Northern Cheyenne Tribal Historic Preservation Officer on September 2, 2004. The purpose of this visit was to provide an opportunity to view the area of development, to gather information to determine if Traditional Cultural Properties were present in the Dry Creek POD area and to consider the Tribe's concerns with the proposed POD.

BLM hosted and conducted an on-site inspection and field tour of the Dry Creek POD area with Gilbert Brady (THPO), cultural representative of the Northern Cheyenne Tribe on September 2, 2004. At the conclusion of the field tour the tribal representative did not express an interest in the area and commented on the fact that there were no Traditional Cultural Properties or culturally sensitive areas identified within the POD area, nor were there any known plant or mineral collecting areas identified in the September 2, 2004 field visit. The one major recommendation made by the Northern Cheyenne Tribal Historic Preservation Officer was a recommendation to have a tribal representative monitor present during all surface disturbing activities that might occur as a result of POD developments.

BLM summarized the findings and comments it received during the September 2, 2004 field tour in a letter to Gilbert Brady of the Northern Cheyenne Tribe, dated September 27, 2004. Findings included: no TCPs or TCP issues were found in the Dry Creek POD area; site testing and subsequent facility construction should avoid disturbance of known cairns and cairn sites; and someone from the Northern Cheyenne Tribe should be present during excavation work by the company to act as a monitor. In that letter BLM proposed mitigation measures based on the results of the field tour. BLM also requested a response to the letter and findings but none was received.

Due to the lack of a response, a second letter was sent to the Tribal President, with a copy to the Northern Cheyenne Tribal Historic Preservation Officer, on November 23, 2004. This letter outlined how BLM proposes to avoid impacts and to mitigate impacts to the various sites located within the Area of Potential Affect and how BLM proposes to proceed and use the comments in the absence of receiving input from the Northern Cheyenne. BLM has incorporated the comments received from the field tour of September 2, 2004, into the environmental document and developed Conditions of Approval that will impose some restrictions on the Company following the approval and signing of the Decision Record for this action.

3.2.2 Paleontological Resources

Paleontological Resources are defined as fragile and nonrenewable scientific records of the history of life on earth (BLM, 1998). Fossils of the Cenozoic's Paleocene epoch (65 to 54 million years ago) have been found in the Fort Union Formation throughout Wyoming and Montana, but no important localities have been identified in the project area. Vertebrate fossil remains are particularly nonexistent in the Tongue River Member of the Fort Union Formation which is the upper most formation within the POD project area. Paleobotanical fossils have been recovered from the Tongue River Member but not within the project area. Past studies of paleontological resources at the Spring Creek and proposed CX Decker Mines have shown that the POD area has a low potential to yield significant vertebrate fossil remains. Fossils located in the Spring Creek Mine area include plant, amphibian, reptile and invertebrates. The POD area occurs in similar geologic formations as the Spring Creek Mine

and similar paleontological resources may occur. Protection of fossil resources on public lands extends to vertebrate fossils or specially designated areas. No areas designated for special management for paleontological resources are located near the project area in Montana. Although invertebrate fossils are not usually considered significant and permitable (the need to obtain a permit to collect) paleontological resources, they do have cultural values to Native American groups and require consideration under laws and executive orders that deal with access and maintenance of religious sites and resources on public lands (Peterson and Deaver, 2002). Fossils on split estate lands are considered part of the surface estate and belong to the surface owner (BLM, 1998). Unanticipated discoveries of paleontological resources during project activities will be dealt with through implementation of measures in the approved federal permit that require notification of BLM's authorized officer in the event of important discoveries and suspension of construction activity to prevent loss of significant paleontological values.

3.3 GEOLOGY AND MINERALS

3.3.1 Geology

The project area lies in the northern portion of the Powder River Basin. The Powder River Basin is an asymmetrical, northward plunging, sedimentary basin; its structural axis is located closer to the west flank of the basin than the east side.

The project area is also near the basin axis with the rock strata dipping gently to the south, southwest about 1° to 2° although localized structures, such as faulting and folding can cause steeper dips or changes in dip direction.

Numerous faults occur in the area in a fault zone just north of the Montana, Wyoming state line. These faults trend from southwest to northeast, are typically down dropped to the south and may have displacements of up to 150 feet as in the Spring Creek and Carbone faults located at the Spring Creek Coal Mine. Three possible faults have been mapped within the POD boundary and several more are located on both east and west sides of the project area. Technical data on these faults is currently unavailable.

Outcropping bedrock in the area consists of the Tertiary-age Wasatch and Fort Union Formations. The Wasatch Formation

unconformably overlies the Fort Union Formation and can be as much as 600 feet thick. It is made up of yellowish to light gray siltstone, massive to cross bedded sandstones, brown carbonaceous shales, coal seams and red clinker. A brown layer of gastropod shells (coquina) about 6 to 8 inches thick is found about 200 feet above the base of the Wasatch in many areas (Vuke, 2001).

The Fort Union Formation is locally broken into three members (from youngest to oldest): Tongue River, Lebo, and Tullock. The oldest member, Tullock, is composed of light-colored sandstone, sandy shale, carbonaceous shale, clay, and locally thin, non-continuous coal beds. The middle Lebo Member consists of dark shale, mudstone, carbonaceous shale, siltstone, argillaceous sandstone, and coal.

The Tongue River Member contains mineable coal units within the Fort Union Formation and consists of sandstone, interbedded siltstone, shale and thick coal beds. Local depositional environments of the coal seams resulted in formation of several distinct coal beds within the Tongue River Member.

The Tongue River Member of the Fort Union Formation was deposited in a low-lying coastal or near-coastal area, mainly as fluvial and over-bank mud, and back-swamp peat. This depositional setting formed rock types that change markedly over short distances, making it difficult to characterize the nature of overburden or inter-burden intervals.

Where sufficient thickness of coal was deposited and conditions were right, the coal burned. The resulting heat baked and fused the overlying material into a brittle resistant reddish rock, locally called "clinker" or "scoria" deposits (Cole, 1980).

Following coal deposition, the general area was faulted, resulting in displacement of coal seams. Faults in the area are generally oriented northwest and northeast (USDI, 2000).

The Fort Union Formation is underlain by Cretaceous-age Hell Creek Formation and is not exposed in the area.

The target coal formations are the Carney, Monarch, Dietz 1, Dietz 2 and Dietz 3 at depths from 250 feet to 1000 feet.

Areas with oil and gas rights owned by the federal government exist along the north and west sides of the project area.

3.3.2 Gas Migration and Venting

The objective in pumping the water from the CBNG wells is to reduce the pressure and cause the gas to desorb from the coal matrix and migrate to the CBNG well. In reservoir dynamics, as in hydrology, the flow is from areas of high pressure to areas of lower pressure. For this reason, the gas flows towards wells that are pumping water from the coals seam and reducing the pressure enough to cause the gas to be desorbed.

The cumulative effect is more complicated. The pumping of CBNG wells would cause the areas near the wells to desorb the gas and have it flow towards them; however, a reduction in hydrostatic head (pressure) would extend beyond that area over which the gas is desorbed in what is called a “cone of depression”. For this reason, water wells that are finished in a CBNG producing coal seam(s) could produce gas from the water wells at pumping rates that are less than those that would have been required in the past. The water wells would be causing a localized “cone of depression” around the well, which would cause the gas to desorb, and; therefore, the gas flows towards them. This desorption of gas is caused by lower pumping rates than would have been required prior to CBNG production. The cumulative effect of gas migration is also affected by the local Geology of the coal, gas content of the coal and faulting in the area.

The BLM has determined that the potential for methane migration and the potential impacts from the Dry Creek Project are similar to the impacts described in the Wyoming FEIS and Proposed Amendment for the Powder River Basin Oil and Gas Project and the Montana FEIS. These could include migration of methane gas to water wells or to the surface.

Methane migration to water wells, springs or monitoring wells: Based on the water draw down analysis for the project, the 20 foot drawdown for the Dry Creek POD wells would

extend from 1 mile to 2 miles. The ongoing CBNG production and the 30 years of coal mining in the area have drawn down the potentiometric pressure as much as 150 feet within the producing area (see section 3.4.2). A drawdown of 20 feet would be equivalent to a pressure reduction of 8.7 psi in each coal. The gas in the coal requires 10 to 40 percent in pressure reduction before desorption begins, therefore, the radius of pressure reduction sufficient to cause gas to desorb is much smaller than the 20 foot drawdown radius. The pressure in the Dietz 1,2,3 coal is estimated at 123 psi to 255 psi. To enable gas to desorb from this coal would require a reduction of a minimum of 12.3 psi. This would translate to a water drawdown of at least 28.6 feet. The West Decker mine is mining the shallowest Dietz coals, therefore, it is likely that this pressure has been reached already and any wells/springs in the Dietz 1 & 2 may already be affected.

The Hydrology section indicates that within the producing area there is already 150 feet of drawdown. The 150 feet of drawdown would cause a pressure reduction of 65 psi. This would be enough to cause gas to begin to desorb from any of the coals within the producing area.

In the Monarch coal, the formation pressure is estimated to be from 195 psi to 316 psi. This coal would require a minimum of 19.5 psi reduction of pressure before gas would begin to desorb. This translates to a water drawdown of 45 feet.

In the Carney coal, the formation pressure is estimated to be from 257 psi to 370 psi. This coal would require a minimum of 25.7 psi reduction of pressure before gas would begin to desorb. This translates to a water drawdown of 59 feet.

Based on the Hydrology section (3.4.2), there are monitoring wells, water wells or springs within this area that could be affected by methane migration. The monitoring wells are too numerous to list, but can be found on the MBMG GWIC website. The water wells from that website are listed below.

Table 3.3.2-1: Domestic or Stock Wells

GWIC ID	Location	TD	Use	Potential Affect
8410	T9S,R39E,Sec14SENW	300	Domestic	Likely
106144	T9S,R39E,Sec21SESE	615	Stockwater	Likely
106146	T9S,R39E,Sec24NWNW	235	Domestic/stock	Possible
106154	T9S,R39E,Sec24SWSE	244	Domestic/stock	Possible
106155	T9S,R39E,Sec25	150	Stockwater	Not likely
106157	T9S,R39E,Sec32NENW	160	Stockwater	Not likely
106156	T9S,R39E,Sec29NWSE	64	Stockwater	Not likely

The operator has certified that water mitigation agreements have been reached with all potentially affected owners of wells and springs in accordance with the requirements of MBOGC Order No. 99-99. This Order requires that operators offer water mitigation agreements to owners of water wells or natural springs within one mile of a CBNG field, or within the area that the operator reasonably believes may be impacted by CBNG production, whichever is greater, and to extend this area one-half mile beyond any well adversely affected. This order applies to all wells and springs, not just those which derive their water from the developed coal seams. This Order requires "...prompt supplementation or replacement of water from any natural spring or water well adversely affected by the CBM project..." These agreements would apply to those wells which

experience an impact to their use whether it is due to decreased yields, the migration of methane, or a change in water quality.

Methane migration to conventional wells in the area; there is one abandoned conventional oil well within the project area, a well in section 24, T. 9 S., R. 39 E. All the conventional wells that are in or near this POD area are listed below. The wells in section 16 and 17, T. 9 S., R. 40 E. are inside the Decker Mine boundary and have had the surface casing removed and been re-plugged below the level of mining operations. They should not provide a conduit for methane migration to the surface. The well in Section 24 has been plugged inside the surface casing so it should not provide a conduit for methane migration to the surface.

Table 3.3.2-2: Conventional Oil & Gas Wells

Well	Location	Total Depth
1	T9S,R40E,Sec17NENE	8334 feet
1	T9S,R40E,Sec16SESE	3485 feet
20-1	T9S,R40E,Sec20SWSW	5803 feet
1	T9S,R39E,Sec27NWNW	6000 feet
1-17	T9S,R39E,Sec17SWSW	5980 feet
1	T9S,R39E,Sec16NESW	6034 feet
1	T9S,R39E,Sec24NWNW	5508 feet

Drainage of Federal Mineral resources; federal minerals butt directly up to the north and west of the proposed POD area. As a result, there will likely be drainage situations identified as the wells in the POD begin producing. These situations will be handled on a case by case basis.

3.4 HYDROLOGY

3.4.1 Surface Water

All of the proposed well sites are located in the Upper Tongue River 4th Order Watershed. The Tongue River is the only perennial river in the project area. The Tongue River is considered high quality water pursuant to Montana's Non-degradation Policy and degradation of high

quality water is not allowed unless authorized by the Department under 75-5-303(3), MCA. The TMDL process for the Tongue River watershed is currently underway.

The entire length of the Tongue River below the Tongue River Dam is affected by the presence of the Tongue River Dam. The presence of this dam causes sediment to be trapped behind the dam, and causes the magnitude of peak flows to be reduced, thereby altering the riparian environment (Collier, et al., 1996). The flow along the reach below Pumpkin Creek is also substantially reduced during the irrigation season by the diversion of water into the TY irrigation ditch. During low flows, the majority of the

water in the Tongue River is diverted at this point, and any measurements taken below this point are more representative of Pumpkin Creek and other minor tributaries than they are of the Tongue River.

The reach of the Tongue River where the discharge is proposed to occur (upstream from the reservoir) is not listed on the MDEQ's current (2002) 303(d) list for impaired streams under the Clean Water Act (CWA), nor is it listed on the Draft 2004 303(d) list. This reach was listed on the 1996 303(d) with the cause of impairment being identified as Flow Alteration; the probable source of this impairment was identified to be Agriculture, Irrigated crop production, and Natural sources (MDEQ, 2003b). Thus this reach was listed due to a lack of flow. This reach has been removed from the 2000, 2002, and the 2004 303(d) lists based on reassessment of the water quality.

The portion of the Tongue River from the diversion dam just above Pumpkin Creek (12-mile diversion dam for the TY irrigation ditch) to the mouth is currently listed on the 303(d) list, and has been listed since 1996. This portion of the Tongue River is located approximately 100 miles NNE from the project area (~142 river miles downstream). The MDEQ has identified flow alteration as the probable cause of the impairment, and dam construction and flow regulation/modification as the probable sources of impairment along this downstream reach. This reach was listed due to a lack of flow.

Squirrel Creek is an intermittent/perennial (has perennial and intermittent reaches throughout its length) tributary to the Tongue River and flows within the boundaries of the Dry Creek POD. Neither Squirrel Creek, nor any of the ephemeral tributaries to the Tongue River in this area, have been listed as impaired.

This project would not contribute to the impairment of any 303(d) listed streams. There are several reasons for this, including (1) the proposed discharge is small relative to the river at the point of discharge (1.6% of flow at LMM), (2) flows below the dam are controlled by reservoir releases, and (3) 120 miles of tributary inputs and irrigation removals (especially the TY diversion dam). Thus, flows in the lower listed reach are a function of agricultural demands and not natural flows or CBNG inputs in the upper basin. In addition, even if this project did cause a

measurable increase in flow, the listing is because of decreased flows so this project would not be adding to the impairment.

The proposed action for the Fidelity Dry Creek Project includes the discharge of untreated produced water into the Tongue River between the state line and the Tongue River Reservoir under Fidelity's existing Montana Pollution Discharge Elimination System (MPDES) permit (MT0030457). There is a USGS Gaging Station on the Tongue River located between the state line and the reservoir. Data from this station should be representative of this reach of the Tongue River.

Prior to the issuance of the MPDES permit, an analysis of all parameters for which surface water quality criteria had been developed was conducted. Surface water quality criteria for Electrical Conductivity (EC) and Sodium Adsorption Ratio (SAR) had not been developed at that time. EC and SAR are primary constituents of concern with CBNG discharges (MDEQ, 2003a), therefore, the discussion in this document will focus on these parameters.

EC is the ease with which current will pass through a water sample, and it is proportional to the salinity of the sample. SAR is a complex ratio of sodium to calcium and magnesium, and is an important parameter for determining the utility of water for irrigation due to the potential impacts of sodium on clay rich soils. EC and SAR are the primary factors that determine the usability of water for irrigation, and irrigation is the use that has been determined to be most sensitive to CBNG inputs (MDEQ, 2003a).

Also, this analysis will focus on the Tongue River since the only proposed discharge of CBNG water is to the Tongue River. Squirrel Creek will not be analyzed in detail since no discharge to this creek is proposed under any alternative.

The existing CBNG discharge to the Tongue River is currently discharging untreated CBNG water at a rate of approximately 1,138 gpm between the state line and the reservoir. This discharge is permitted for up to 1,600 gpm under the MPDES permit. Two other CBNG permits have been submitted to the MDEQ for the Tongue River. These discharges are summarized on Table 3.4.1-1. The recently approved permit for the Powder River Gas project (MT0030660),

and the pending Fidelity application (MT0030724) are both for treated discharges. The Fidelity treated discharge is proposed to be located upstream of the Tongue River Reservoir,

but is not part of the Dry Creek proposal. The Powder River Gas discharge will be below the Tongue River Dam.

Table 3.4.1-1: Existing and Proposed CBNG MPDES Permits

Permit Number	Owner/Operator	Permit Status	Potential Discharge Volume (gpm)	Treated (Y/N)
MT0030457	Fidelity Exploration & Production Company	Approved, under review	1,600	N
MT0030660	Powder River Gas, LLC	Approved	1,122	Y
MT0030724	Fidelity Exploration & Production Company	Application Pending	1,700	Y

The historical water quality, as measured by EC and SAR, at the Tongue River stations near the state line, below the dam, and at Birney Day School are shown in Table 3.4.1-2. This historical water quality data was determined based upon USGS data prior to 1998. These Pre-CBNG data do not accurately represent the existing conditions because the existing untreated CBNG discharge (MT0030457) is occurring upstream from the reservoir. This untreated water has an EC of approximately 1,987 $\mu\text{S}/\text{cm}$ and an SAR of approximately 53.8. It is necessary to model the effect of this discharge at its current level in order to reflect existing conditions. A comparison of historical conditions to modeled existing conditions is provided in Table 3.4.1-2. Calculations are made during low mean monthly flows (LMM; the lowest mean monthly flow value for the station), high mean monthly flows (HMM; the highest mean monthly flow value for the station), and 7Q10 flows (a statistical value indicating the lowest flow that would be anticipated to occur for seven consecutive days over any 10 year period). Analysis is conducted at the State Line station to reflect conditions upstream from the Tongue River Reservoir, at the station below the Tongue River Dam to reflect the effects of mixing in the Reservoir, and at the Birney Day School station, which is located at the southern boundary of the Northern Cheyenne Reservation and provides for comparison to the Tribal Surface Water Quality Criteria.

A noticeable increase in either EC or SAR has not been observed in USGS monitoring data since the start of CBNG production when values are plotted vs. flow. These data for the Birney Day School station are shown on Charts 3.4.1-1, and 3.4.1-2. As shown on these charts, the changes that are anticipated by the model would

be within the natural variability of the data, thus this lack of response may be in part due to the natural variability of the data (i.e. signal to noise). This comparison does show that the modeled result should be consistently above the historical power line, however, monitoring data is scattered on both sides of this line. As such, it appears that the model used is somewhat conservative.

Upstream of the reservoir, the results are based upon simple mixing with historical water samples collected between May, 1994 and September, 1995. This time period was chosen because of the relative abundance of data, which was available for this time period. Resultant SAR values are calculated from the resultant Na, Ca, and Mg values. The resultant SAR and EC values are then graphed vs. flow, and used to extrapolate water quality values at the flows in question (7Q10, LMM, and HMM). The resultant extrapolated values are adjusted by a constant correction factor to adjust for the difference between the historical record for this site up to 1998, and the shorter data set used for this analysis. These constant values were determined by comparing the extrapolated values from the model with no CBNG inputs to extrapolated data using Pre-98 data. All CBNG discharge above the reservoir were added at this station and mixed.

Below the dam, the resultant water quality data are based upon the inputs from upstream of the reservoir from May, 1994 to September, 1995 being mixed with the coal mine discharges into the reservoir, and complete mixing in the reservoir. The effect of the reservoir is to moderate the variability of water quality (i.e. the water quality at the State Line station from the reservoir is more variable than the water quality

at the station below the Tongue River Dam). This approach is supported by the historical record of water quality above and below the reservoir. This approach does not take into account evaporation, infiltration, or chemical reactions in the reservoir. The CBNG discharge from the Powder River Gas project under the cumulative analysis was added to the results from this station. A constant correction factor was also applied to these results which was determined from the difference between the extrapolated values from Pre-98 data, and the results using the shorter data set used in this analysis.

The water quality at Birney Day School was

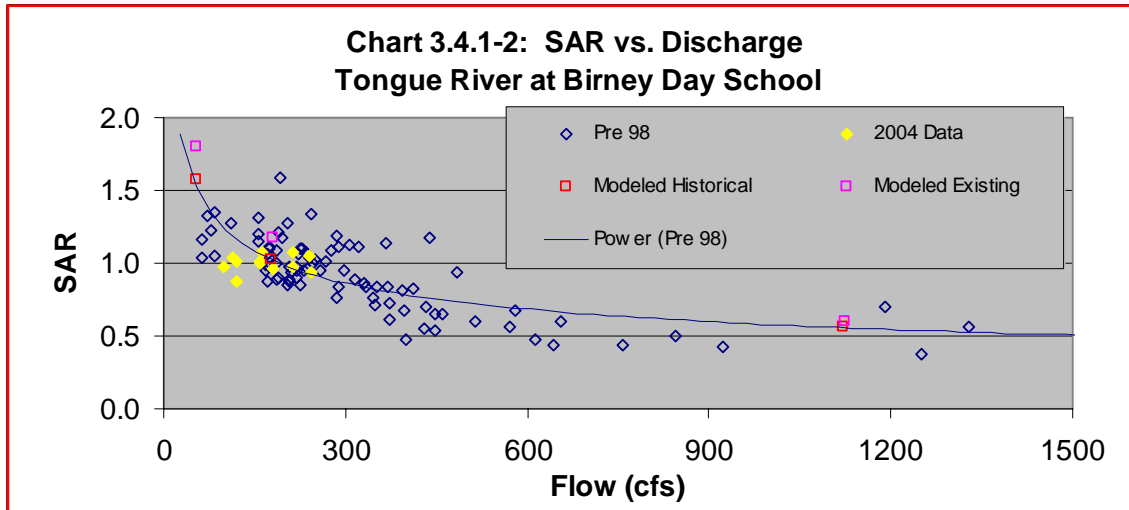
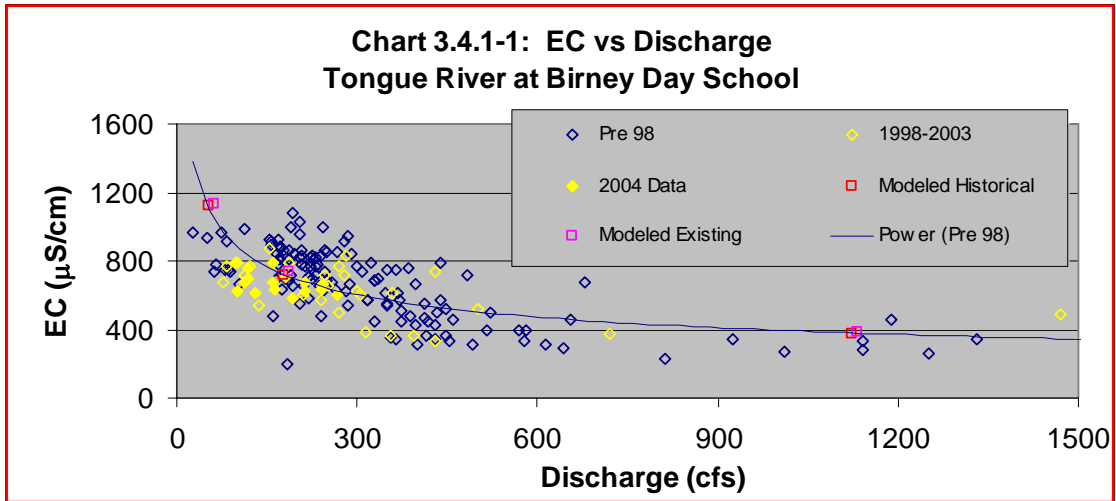
determined by adding the historical increase in EC and SAR, at the flows in question, between the station below the Dam and the station at Birney Day School to the results from below the Dam. This constant correction factor also serves to adjust for differences between the extrapolated values from the Pre-98 data at this site to the results from the shorter data set used in this analysis.

A comparison of Historical (Pre-98) flow, EC and SAR values to the Modeled Existing condition is provided in Table 3.4.1-2. These Modeled Existing conditions will provide for comparison to the direct impacts from the alternatives.

Table 3.4.1-2: Comparison of Historical Conditions to Modeled Existing Conditions

	Flow Conditions	Historical Conditions (Pre-1998) (0 gpm)			Modeled Existing Conditions (1138 gpm)		
		Flow (cfs)	EC (μS/cm)	SAR	Flow (cfs)	EC (μS/cm)	SAR
Tongue River at State Line	7Q10	42.0	1273	1.07	44.5	1307	1.53
	LMM	178.0	682	0.63	180.5	702	0.82
	HMM	1670.0	259	0.27	1672.5	261	0.30
Tongue River Below Dam	7Q10	70.0	825	0.98	72.5	841	1.21
	LMM	179.0	651	0.78	181.5	664	0.93
	HMM	1429.0	390	0.49	1431.5	395	0.53
Tongue River at Birney Day School	7Q10	52.7	1122	1.57	55.3	1138	1.80
	LMM	176.7	717	1.03	179.3	730	1.18
	HMM	1122.7	372	0.56	1125.3	377	0.60

Note: Values in parentheses represent the rate of untreated CBNG Discharge via permit MT-0030457



In addition to the discharges which are currently taking place, it is also necessary to address the potential impacts of the discharge permits which have been applied for or recently approved, and

are therefore reasonably foreseeable (see Table 3.4.1-1). The results of this analysis will provide for comparison of the cumulative impacts for each alternative.

**Table 3.4.1-3: Comparison of Historical Conditions to Projected Conditions
(includes other foreseeable projects inputs)**

	Flow Conditions	Historical Conditions (Pre-1998) (0 gpm)			Modeled Projected Conditions (1138 gpm)		
		Flow (cfs)	EC (μS/cm)	SAR	Flow (cfs)	EC (μS/cm)	SAR
Tongue River at State Line	7Q10	42.0	1273	1.07	48.3	1282	1.60
	LMM	178.0	682	0.63	184.3	703	0.87
	HMM	1670.0	259	0.27	1676.3	262	0.31
Tongue River Below Dam	7Q10	70.0	825	0.98	78.8	835	1.27
	LMM	179.0	651	0.78	187.8	667	0.99
	HMM	1429.0	390	0.49	1437.8	398	0.55
Tongue River at Birney Day School	7Q10	52.7	1122	1.57	61.6	1132	1.86
	LMM	176.7	717	1.03	185.6	733	1.24
	HMM	1122.7	372	0.56	1131.6	380	0.62

Note: Values in parentheses represent the rate of untreated CBNG Discharge via permit MT-0030457

Prior to issuance of the MPDES permit for the ongoing discharge, an analysis was conducted in relation to all existing surface water quality criteria in place at that time. Since that time, the Montana Board of Environmental Quality has established surface water standards for EC and SAR under the Montana Water Quality Act. These standards have been reviewed and approved by the EPA, and therefore have Clean Water Act standing. The Northern Cheyenne Tribe has also adopted surface water quality standards for EC and SAR. The Northern Cheyenne Tribe has not been granted “Treatment as a State” status by the EPA, therefore, the EPA

has not reviewed these standards. As such, the Northern Cheyenne numerical standards do not have Clean Water Act standing; however, they do set out the Tribe’s considered determination of the water quality needed to protect irrigated agriculture on the Reservation (Northern Cheyenne Tribe, 2002), and to protect native plant species that have cultural significance and are integral in ceremonial and traditional aspects of the Northern Cheyenne Tribe. Therefore, the Northern Cheyenne standards provide reasonable criteria against which to compare the resulting water qualities. These various standards are summarized on Table 3.4.1-3.

Table 3.4.1-4: Surface Water EC and SAR Standards for the Tongue River

	Monthly Mean SAR	Inst. Max SAR	Monthly Mean EC (μS/cm)	Inst. Max EC (μS/cm)
MDEQ Irrigation Season ¹ Standards ²	3.0	4.5	1000	1500
MDEQ Non-Irrigation Season ¹ Standards	5.0	7.5	1500	2500
Northern Cheyenne Irrigation Season ¹ Standards; Southern Boundary	---	2.0	1000	2000
Northern Cheyenne Non-Irrigation Season ¹ Standards; Southern Boundary	---	2.0	---	2000

1: The Irrigation Season specified by the MDEQ is from March 1st to October 31st while the Irrigation Season specified by the Northern Cheyenne is from April 1st to November 15th.

2: The Irrigation Season standards apply to the portion of the Tongue River between the State Line and Tongue River Reservoir for the entire year.

For the purposes of this impact analysis, the high mean monthly and low mean monthly results will be compared to the mean monthly standards, while the 7Q10 result will be compared to the instantaneous maximum standards. This is appropriate since the 7Q10 is the lowest flow that would be expected to occur for 7 consecutive days over any 10 year period.

For more general information regarding surface water, refer to the MT FEIS Chapter 3, Affected Environment, pages 3-22 through 3-31 (BLM, 2003b), the Water Resources Technical Report (ALL, 2001), and the Surface Water Quality Analysis Technical Report (SWQATR) (Greystone and ALL, 2003). Real time and historical monitoring data for the Tongue River are also available from the USGS at <http://tonguerivermonitoring.cr.usgs.gov/index.htm>.

3.4.2 Groundwater:

The federal wells to be drilled under this proposal are to be between approximately 300 and 800 feet below ground surface (BGS) into the Dietz, Monarch and Carney coal zones. Of the 24 proposed federal wells, 5 would be finished in the Dietz beds, 8 would be finished in the Monarch, and 11 would be finished in the Carney. Additionally one existing CBNG well finished in the Dietz coal seam would be hooked up for production.

All of the coal zones proposed for development are contained within the Tongue River Member of the Fort Union Formation. The Dietz zone is typically split into 3 beds (D1, D2 and D3). Based upon the drilling analysis contained within the Dry Creek POD, the top of the Dietz coal zone is between 3,349 and 3,461 feet above mean sea level (ft-amsl) in this area, dipping to the south-southeast. The Dietz coal zone is approximately 80 feet thick in this area. The top of the Monarch coal seam is between 3,180 and 3,360 ft-amsl in this area, dipping to the south-southeast. The Monarch is approximately 19 feet thick in this area. The top of the Carney coal seam is between 3,021 and 3,148 ft-amsl in this area, dipping to the south-southeast. The Carney is approximately 22 feet thick in this area.

When CBNG is produced, the groundwater

levels in the coal seams are drawn down to near the top of the coal seams and then held at that level. This reduces the hydrostatic head within the coal seam and allows the methane to become desorbed from the coal surface and flow to the well. Dewatering of the coal is not desired since this would require excessive pumping of water due to the advent of unconfined conditions (i.e. actual dewatering of the pore spaces vs. reducing the pressure within the coal seam). Also, dewatering would cause the cleat (fractures) within the coal to close up and inhibit the flow of methane to the well. As a result of holding the hydrostatic head just above the top of the coal seam (a constant head situation), the rate of water production per well must decrease over time as the pressure within the aquifer is reduced over an increasing geographic area.

Any drawdown that occurs within the developed coal seam would be limited to that coal seam, and not extend to the overlying or underlying units. The coals within the Tongue River member of the Fort Union formation are typically bounded by clay rich strata, and as such the vertical hydraulic conductivity in this unit is very low (Wheaton and Donato, 2004a). Based upon the results of 370 aquifer tests, Wheaton and Metesh (2002) have calculated that the geometric mean horizontal hydraulic conductivity (K) values of the coal seam aquifers in the Fort Union Formation is 1.1 feet per day. Mean storativity (S) values of these coals are approximately 9×10^{-4} (storativity is unitless) (Wheaton and Metesh, 2002).

It has been determined that 20 feet of drawdown is an appropriate criteria to use in assessing the potential impacts to groundwater resources as a result of CBNG activity (BLM, 2003b). For this analysis, the average radius of the 20 foot drawdown contour from the edge of the CBNG field is determined by using the Theis equation for drawdown in a confined aquifer (Fetter, 1994) and regional hydrogeologic parameters (Wheaton and Metesh, 2002). The rate of discharge from all pumping wells in each coal seam is simulated as a single well with the resulting radius of drawdown being applied to the exterior of the well field. This is appropriate since the shape of the curve of change in head vs. distance (dh/r) for a particular pumping rate is a function of the aquifer properties. These

confined aquifer calculations will adequately address the drawdown in the coal seam aquifers since the clay rich layers in the Tongue River member of the Fort Union Formation are known to make the vertical hydraulic conductivity of this unit very low (Wheaton and Donato, 2004a). It is known that faults occur in this area; however, the precise locations of all faults are not known. Faults in this area are believed to be boundaries to groundwater flow (VanVoast and Reiten, 1988). In those areas where the drawdown cone intersects a fault, the cone will be truncated at the fault and the cone will extend asymmetrically away from the fault. It is also likely that the coal seam aquifers are not isotropic, in that there is likely to be a preferred flow direction due to the cleat of the coal and the orientation of secondary fractures; however, the orientation of the cleat and the fractures are not known and it is not known what degree of anisotropy would result from them. As such, it should be noted that the results of this analysis are only applicable as average distances which drawdown of 20 feet or more will reach from the producing field. This approach is appropriate given the purpose of this analysis. The concepts behind this modeling are discussed in more detail in the Hydrology Technical Report for the Powder River Gas-Coal Creek POD. Monitoring will be the key to determining if actual impacts are occurring. Monitoring wells are in place in this area, and they are being monitored by the Montana Bureau of Mines and Geology. MBOGC Order 99-99 also requires the monitoring of potentially affected water sources by the CBNG operator.

The Montana Bureau of Mines and Geology (MBMG) maintains the Groundwater Information Center (GWIC) database of known wells, springs, and borings in Montana. Under current Montana law, drillers are required to provide well logs to MBMG for all wells drilled, or indirectly to DNRC, within 60 days of drilling the well. This database is used to determine the wells or springs, which are located within the potential drawdown area.

Those wells that are finished within the coal seams being developed, and are located within the potential drawdown area, would be anticipated to be impacted by groundwater drawdown. Those springs which emit from the developed coal seam and are located within the potential drawdown area would be anticipated to be impacted by groundwater drawdown. Wells

and springs that are impacted by groundwater drawdown would experience a decrease in yields; however, they would not be anticipated to go dry since the coal would remain saturated, but depressurized.

The operator has certified that, in compliance with MBOGC Order 99-99 (Designation of the Powder River Basin Controlled Groundwater Area), executed water mitigation agreements are in place. This Order requires that operators offer water mitigation agreements to owners of water wells or natural springs within one mile of a CBNG field, or within the area that the operator reasonably believes may be impacted by CBNG production, whichever is greater, and to extend this area one-half mile beyond any well adversely affected. These mitigation agreements apply to any spring or well adversely impacted by CBNG wells.

Coal seam groundwater levels in this area have already been drawn down. Coal mines have contributed to this drawdown over the past 30 years of mining activity. More recently CBNG development in this area has caused the groundwater levels to be drawn down more dramatically over the past 4 years. Ongoing monitoring indicates that "After 4 years of production from the CX field, water levels have been lowered by 20 feet at distances of less than 1 mile to as much as 2 miles outside the production area. Within the production areas, water levels are as much as 150 feet lower than baseline conditions. As production continues and as field sizes enlarge, greater drawdown is expected to occur; and at greater distances from the well field." (Wheaton and Donato, 2004a). According to MBMG's GWIC database, there are 16 domestic or stock wells within the current 20 foot drawdown contour. These wells are listed shown on Map Hydro-1, and listed on Table Hydro-8 in the Hydrology Appendix.

The CX Field, Montana, has 463 producing CBNG wells, which have been completed in the Dietz, Monarch, and Carney coal seams. Additionally, 2,599 wells have been completed in Sheridan County, Wyoming (Wyoming Oil and Gas Commission Website, November 13, 2004; <http://wogcc.state.wy.us>). Of these Wyoming wells, it is estimated that approximately 2,000 are contiguous with the Montana development, and completed in the same coal seams. It is further assumed that approximately 400 Wyoming CBNG wells are

finished in each of the 5 coal seams (Dietz 1, Dietz 2, Dietz 3, Carney, and Monarch) contiguous with the CX Ranch area in Montana. If these wells (463 in MT and 2,000 in WY) were to be produced for 20 years, and no more wells came on line, it would be anticipated that the 20 foot drawdown contour would extend approximately 4.77 miles (25,204 feet) from the existing development areas. The results of this analysis are shown in the Hydrology Appendix on Table Hydro-4. This potential drawdown area is shown on Map Hydro-1 in the Hydrology Appendix. According to MBMG's GWIC database and the USGS NHD dataset, there are 100 domestic or stock wells and 16 springs in both Montana and Wyoming within the potential 20 foot drawdown contour that may result from the existing CBNG wells. Many of these wells are not finished in the coal seam to be developed since these coal seams are typically deeper than the first available water. Similarly, it is not anticipated that many of these springs receive their water from the coal seams to be developed since most springs in this area receive their water from local rather than regional flow systems (Wheaton and Donato, 2004b), and since the hydrostatic pressure near outcrop is not sufficient to cause adsorption of the methane (VanVoast and Thale, 2001). These wells are listed in the Hydrology Appendix on Tables Hydro-8 and Hydro-9.

In addition to these existing CBNG wells, it is also necessary to account for the effects of those CBNG wells that are foreseeable, would be completed in the same coal seams, and are not associated with the proposed action. The compilation of the effects of all of these wells will provide context for comparison of the cumulative effects of the alternatives. For this analysis, the foreseeable CBNG wells are those for which permits to drill have been applied for. The only project that proposed to develop the same coal seams as the proposed action is Fidelity's Coal Creek POD. This POD is for 210 CBNG wells. The effect of adding these wells is to increase the radius of the 20 foot drawdown contour from the well field to 4.79 miles (25,300 feet) (0.02 miles (96 feet) further than without them). The results of this analysis are included in the Hydrology Appendix on Table Hydro-6. The addition of Fidelity's Coal Creek POD area also expands the "well field" from which the radius is applied (see Map Hydro-1). The overall effect of adding this foreseeable development is that 10 more wells and 3 more springs are

included within the 20 foot drawdown contour. These additional wells and springs are listed in the Hydrology Appendix on Table Hydro-10. This results in a cumulative total of 110 wells and 19 springs within the foreseeable 20 foot drawdown contour.

Based upon water analysis from existing production in this area, it is anticipated that the water produced from the CBNG wells in the POD area will have an SAR comparable to the water currently being produced from the CX field, having an SAR of approximately 53.8 and an EC of approximately 1,987 $\mu\text{S}/\text{cm}$.

Off drainage impoundment 23-0299 is an existing impoundment on fee surface/fee minerals, which has been approved by MBOGC. This impoundment is used for watering livestock. It is not anticipated that water will infiltrate through the base of this reservoir due to the base being composed of clay, and the CBNG water having a high SAR. When high SAR water is placed in an impoundment that has an appreciable clay content ($>\sim 30\%$), the clay deflocculates and causes the impoundment to seal (Bobst and Wheaton, 2004). It is assumed that this high SAR water has long since caused the base of the impoundment to become impermeable and it is considered to be a total containment basin, with evaporation being the only route by which water can leave the impoundment. This impoundment does not have the potential to impact ground waters, or to create impacts to surface waters. Since this impoundment is located off drainage near the ridge line, it will not intercept an appreciable volume of runoff, and therefore will not impact downstream water rights. Upon pit closure, the soils beneath this impoundment will be tested to determine if any salts have evapo-concentrated to hazardous levels, and the soils will be disposed of in accordance with all applicable federal, state, and local laws. This impoundment does not have the potential to create impacts to hydrologic resources, and so will not be analyzed in detail.

For additional general information on groundwater, refer to the MT FEIS (BLM, 2003), Chapter 3, Affected Environment pages 3-22 through 3-39 (groundwater), the 2D modeling report (Wheaton and Metesh, 2001) and the 3D modeling report (Wheaton and Metesh, 2002). Groundwater monitoring information relating to CBNG (CBM)

development is also available by logging into MBMG's online GWIC database (<http://mbmggwic.mtech.edu/>) and using the Ground-Water Projects link. The most recent CBNG groundwater monitoring report (Wheaton and Donato, 2004a) is also available online (<http://www.mbm.mtech.edu/pdf-open-files/mbmg508.pdf>).

3.5 INDIAN TRUST AND NATIVE AMERICAN CONCERNS

Indian Trust Assets are defined as "lands, natural resources, money, or other assets held by the federal government in trust or that are restricted against alienation for Indian Tribes and individual Indians (DM 302, 2.5)." No Indian lands or Indian owned leases are present in the project area. The Northern Cheyenne Reservation is a Class I PSD Airshed and the Crow Reservation is a Class II Airshed. The Northern Cheyenne Tribe owns water rights on the Tongue River.

The project area is located approximately 3 miles east of the Crow Reservation and 24 miles south of the Northern Cheyenne Reservation. Two isolated tracts of Northern Cheyenne lands (surface and minerals, SW $\frac{1}{4}$ NE $\frac{1}{4}$, N $\frac{1}{2}$ SE $\frac{1}{4}$, Sec. 23, NW $\frac{1}{4}$ SW $\frac{1}{4}$, Sec. 24, N $\frac{1}{2}$ SW $\frac{1}{4}$, Sec. 26,

N $\frac{1}{2}$ SE $\frac{1}{4}$, Sec. 27, T. 8 S., R. 40 E.) are located approximately 4 miles to the northeast of the project area.

3.6 LANDS AND REALTY

The project area is composed of a mixed ownership of both the surface estate and mineral estate. Ownership of the surface estate and mineral estate is split among BLM, State of Montana and private. The surface and mineral (oil and gas) acreages are found in Table 3.6-1. The entire project area is within the Powder River Basin Known Coal Leasing Area (KCLA). There are no withdrawals or mining claims affecting the subject Federal land.

There are no BLM authorized rights-of-way on the affected Federal lands. There are 12 buried four-inch poly gas lines in the NE $\frac{1}{4}$ NW $\frac{1}{4}$, Section 19, T. 9 S., R. 40 E., and three buried four-inch poly gas lines, one buried three-inch poly water line, and an access road in the NW $\frac{1}{4}$ SE $\frac{1}{4}$, Section 13, T. 9 S., R. 39 E., which were inadvertently constructed on BLM surface about 4 years ago and discovered during the review of Fidelity's Dry Creek POD. The unauthorized case for these facilities has been processed and closed.

**Table 3.6-1
Surface & Mineral Ownership**

Type	Appx. Acres	Type	Appx. Acres
BLM Surface	729	BLM Minerals	2,973
State Surface	480	State Minerals	480
Private Surface	5,231	Private Minerals	2,987
Total	6,440	Total	6,440

3.7 LIVESTOCK GRAZING

Livestock grazing is one of the two primary uses of the land in the project area. The surface owner leases the grazing on the private surface to one livestock operation. The BLM administered surface is leased to the same livestock operation. The livestock operation runs cow/calf pairs mainly during the summer; however, limited winter use occurs.

3.8 RECREATION AND VRM

The BLM surface is comprised of scattered parcels ranging in size from 40 to 160 acres.

None of these parcels has legal public access. Recreational opportunities in this general area would include fall hunting, wildlife viewing, collecting and other non-consumptive activities.

Scenic values are determined using the characteristic landscape. In this case, the characteristic landscape includes considerable previous development. The scattered BLM surface is not sufficient in size for BLM's management to affect scenic values on the overall landscape. Therefore, the BLM surface for this project would be managed under a Class

IV management objective which allows for major modification of the landscape.

3.9 SOCIAL AND ECONOMIC CONDITIONS

The project area is within the producing CX Field located in the southeastern corner of Big Horn County, just west of the West Decker Mine and southwest of Rosebud County. It is five miles east of the Crow Reservation, twenty-five miles south of the Northern Cheyenne Reservation and twenty-five miles by paved road from Sheridan, Wyoming. A description of the social, economic and fiscal conditions on the Reservations and Big Horn and Rosebud Counties are found in the Affected Environment Chapter 3 and the Socioeconomic Appendix of the MT FEIS. The MBOGC reported natural gas production in Big Horn county in 2002 was 9,679,910 MCF (DNRC Annual Review 2002, Page 19), approximately 11 percent of total statewide production. However, Oil & Gas production taxes contributed less than one-tenth of one percent of County revenues in FY 1999 (MT FEIS 2003, Socioeconomics Appendix, Table SEA-1). The Minerals Management Service reported Big Horn County Federal gas production of 258,209 MCF in FY2001, latest data available, with royalty payments of \$118,646.

3.9.1 Environmental Justice

Based on the 2000 Census data, Big Horn and Rosebud Counties include Indian reservations with substantial Native American populations. In Big Horn County, where the project is located, the population is 60% Native American. This county includes most of the Crow Reservation and part of the Northern Cheyenne Reservation. Slightly over 30% of Rosebud County is Native American. This county is located north of the project area and includes the part of the Northern Cheyenne Reservation not located in Big Horn County. In 2000, over 5000 Native Americans lived on the Crow Reservation and over 4000 Native Americans lived on the Northern Cheyenne Reservation.

In 2000, 24% of the population living in Big Horn County and 17% of the population in Rosebud County had incomes below the poverty level. These figures compare to a state figure of 13% and reflect the relatively large numbers of persons on the reservations living in poverty.

3.10 SOILS

Soils within the project area were identified from the *Soil Survey of Big Horn County Area, Montana* (USDA, 1977). The soil survey was performed by the Natural Resource Conservation Service according to National Cooperative Soil Survey standards. Pertinent information for analysis is included in Fidelity's POD or in the Dry Creek Soils Technical Report from the published soil survey and the National Soils Information System (NASIS) database for the area. Information in the POD includes a soil map, general soils descriptions, official series descriptions, chemical properties, physical properties, rangeland productivity, plant communities, and erosion related attributes.

Soils in the project area have developed in colluvium and residuum derived from the Tongue River Member of the Tertiary Fort Union Formation and the Eocene Wasatch Formation. Lithology of these units consists light to dark yellow and tan siltstone and sandstones with coal seams in a matrix of shale. In some areas, the near surface coals have burned, baking the surrounding rock, producing red, hard fragments called clinker. Differences in lithology have produced the topographic and geomorphic variations seen in the area. Higher ridges and hills are often protected by an erosion-resistant cap of clinker or sandstone. Soils within the area are distributed according to differences in parent material (both residual and depositional), elevation, moisture, and topographic slope and position.

Soils are deep, greater than 40 inches, on alluvial fans, basins, and valley alluvium. Shallow soils, less than 20 inches, occur on plains and ravines underlain by sandstone, siltstone, and shale bedrock as well as in areas with steeper topography. Moderately deep soils are those considered between 20 and 40 inches; these soils generally lie on residual upland plains and relatively gentle sideslopes.

Soil units potentially affected by the proposed action include:

Arvada soils are very deep (>60 inches), well drained soils formed in alluvium and colluvium derived from sodic shale. These soils formed on alluvial fans, fan remnants, fan terraces and hillslopes. Slopes are 0 to 25 percent.

Hydro soils are very deep (>60 inches), well

drained soils on terraces and footslopes. Slopes are 0 to 15 percent.

Lohmiller soils are very deep (>60 inches), well drained soils formed in alluvium on bottom lands. Permeability is slow or moderately slow. Slopes range from 0 to 8 percent.

Midway soils are shallow (<20 inches), well drained soils that formed in residuum and slope alluvium from calcareous platy shale. These soils formed on ridge crests, mesas, plains, and hills in shale uplands. Slopes range from 0 to 40 percent.

Spearman soils are shallow (<20 inches), well drained soils that formed in residuum and alluvium from clinker. They formed on ridge crests, mesas, plains, and hills in clinker uplands. Slopes range from 0 to 40 percent.

Thedalund soils are moderately deep (20-40 inches), well drained, moderately permeable soils formed in thick calcareous alluvial materials. Thedalund soils are on hills and ridges and have slopes of 0 to 30 percent.

Thurlo soils are very deep (>60 inches), well drained soils that formed in calcareous clay loam unconsolidated materials. These soils formed in valleys on river and stream terraces with slopes from 0 to 15 percent.

Travessilla soils are very shallow (<10 inches) and shallow (<20 inches), well drained soils that formed in calcareous eolian sediments and material weathered from sandstone. These soils are on hills, cuestras, scarps, and mesas with slopes ranging from 0 to 75 percent.

Wibaux soils are very deep (>60 inches), well drained soils formed in colluvium and alluvium derived from clinker. Wibaux soils are on hillslopes, knolls and ridges. Slopes range from 0 to 75 percent.

These soils commonly have surface and subsurface textures of clay loam and silty clay loam with occasional sandy loam or channery surface. See Fidelity's POD for the soils map.

Slopes in the project area range up to 40 percent, though generally actions will occur on the lower end of this range.

Hydrologic groups are predominately C and D

indicating high runoff potential, and rutting hazard is high due to low soil strength. This combination of characteristics indicates that off road vehicle traffic may be particularly damaging to the soil surface under high soil moisture conditions and potentially lead to accelerated water erosion during runoff events.

There is no prime or unique farmland in the project area, though Lohmiller silty clay loam is considered farmland of statewide importance. There is no flooding or ponding hazard for these soils.

The existing off-channel impoundment, 23-0299, is underlain by two, low-permeable clay materials. The two soil types that have been mapped in the area of the impoundment are the Renohill and Winnett soils. The Renohill soil is a silty clay with a high shrink-swell potential and bedrock at a depth of 20 to 40 inches. The Winnett soil is a clay soil with a high shrink-swell potential and shallow depth to bedrock (20 to 40 inches). The surface and near surface clays observed at this location are anticipated to limit subsurface infiltration.

3.11 VEGETATION

The majority of the project area is an upland community dominated by grasses, but includes shrubs and trees. Dominant upland species include bluebunch wheatgrass (*Agropyron spicatum*), western wheatgrass (*Agropyron smithii*), green needlegrass (*Stipa viridula*), blue grama (*Bouteloua gracilis*), needle and thread (*Stipa comata*), prickly pear cactus (*Opuntia spp.*), big sagebrush (*Artemisia tridentata*), Ponderosa pine (*Pinus ponderosa*), Rocky Mountain juniper (*Juniperus scopulorum*). Differences in dominant species within the project area vary with soil type, aspect and topography. The project area includes a portion of the Squirrel Creek drainage. Squirrel Creek is an intermittent stream and supports some woody and herbaceous riparian vegetation.

There are no known threatened or endangered plant species in the project area. However, one plant species identified on the Montana Plant Species of Concern list, Barr's milkvetch (*Astragalus barrii*), has been recorded within the project area boundary. Another Montana Plant Species of Concern, Nuttall's desert-parsley (*Lomatium nuttallii*) has been recorded just outside the project area boundary (Barton & Crispin, 2003). Barr's milkvetch and Nuttall's

desert-parsley are both identified as regional endemics and are designated Watch Species by the BLM in Montana. A third species on the Montana Plant Species of Concern list the Woolly twinpod (*Physaria didymocarpa* var. *lanata*), has been documented in outlying areas. Woolly twinpod is a regional endemic. The habitats where these three species have been recorded consist of sparse vegetation, which includes Ponderosa pine, Rocky Mountain juniper, blue bunch wheatgrass, western wheatgrass, big sagebrush and rabbitbrush (*Chrysothamnus* spp.) Typically, these species are found on rocky slopes of sandstone, siltstone, or clayey shale, in open pine woodlands.

3.11.1 Invasive Species

No state-listed noxious weeds or invasive/exotic plant infestations were discovered through a search of inventory maps and/or databases or during subsequent field investigation by the proposed project proponent. However, Leafy spurge is common in the region and is spreading rapidly. While not currently occupying the site, it is reasonable to expect this species could spread to the project area.

3.12 WILDLIFE AND FISHERIES/ AQUATICS

Several wildlife habitat types exist within the Dry Creek project area, ranging from riparian to upland habitat types. Squirrel Creek dissects the middle of the project area (northwest to southeast), and empties into the Tongue River approximately 1.75 miles from the southeast corner of the project area. The riparian vegetation found along Squirrel Creek, includes tree and shrub species, such as cottonwood, ash, boxelder, and willow. These species are found mostly within the upper reaches of Squirrel Creek within the POD boundary. Understory species include rushes and sedges. Within the Squirrel Creek watershed, topography transitions from an open valley with gentle slopes to a narrow drainage bottom enclosed by steep hillsides. The valley bottom adjacent to Squirrel Creek consists of hay lands or sagebrush grasslands and gives rise in most areas to rougher type topography with sagebrush and/or scattered juniper/ponderosa pine vegetation.

Current land uses include livestock grazing and CBNG production on most of the private lands within the the CX Field of which the Dry Creek project is a part. An all weather access road also splits the project area, with several existing two-

tracks providing vehicle access to a majority of the POD area.

The Dry Creek project area has been evaluated by BLM biologists for wildlife values. Also, Fidelity has contracted with Hayden Wing associates to develop a wildlife monitoring and protection plan (WMPP) for this area, in accordance with the requirements set forth in the MT FEIS. Extensive baseline wildlife surveys have been conducted by Hayden Wing biologists for threatened and endangered species, BLM sensitive species, and other wildlife species. Based on threatened and endangered species surveys, the project area does not provide habitat for the following species: interior least tern (*Sterna antillarum athalassos*), gray wolf (*Canis lupus*), Canada lynx (*Felis lynx canadensis*), grizzly bear (*Ursus arctos horribilis*), pallid sturgeon (*Scaphirhynchus albus*), Ute ladies'-tresses (*Spiranthes diluvialis*), Montana arctic grayling (*Thymallus arcticus*), and warm spring zaitzevian riffle beetle (*Zaitzevia thermae*). Because these species do not exist within this area, they will not be discussed further.

Surveys were also conducted for species including bald eagles (*Haliaeetus leucocephalus*), sharp-tailed grouse (*Tympanuchus phasianellus*), sage grouse (*Centrocercus urophasianus*), black-tailed prairie dogs (*Cynomys ludovicianus*), mountain plover (*Charadrius montanus*), and black-footed ferrets (*Mustela nigripes*). Sections 3.12.1-8 summarizes observations collected during these surveys by BLM biologists and Hayden Wing associates.

3.12.1 Threatened and Endangered Species

Two wildlife species listed as threatened or endangered, under the Endangered Species Act occur or have the potential to occur within this area. These include the bald eagle and the black-footed ferret.

Bald eagles are the only known federally listed threatened or endangered species that are known to inhabit this area. The Tongue River corridor is considered important bald eagle habitat. Bald eagles will use the Tongue River for nesting, foraging, and as a migration route. Currently, the stretch of the Tongue River from just south of the MT/WY border up to Birney, MT supports five active bald eagle nests. Bald eagles also winter within this corridor. Several flights were conducted from December, 2003 through March,

2004 to inventory potential sites along the Tongue River for communal or winter roost sites. No definitive winter roosts were identified during these flights, although anywhere from 15 to 50 bald eagles were observed along this stretch of the Tongue River during separate surveys.

The southern boundary of the Dry Creek project area is located between 0.75 and 1.75 miles from the Tongue River. Two active bald eagle nests are located approximately 4 miles from the nearest federal Dry Creek POD CBNG well, one to the east, and one to the south. Although no bald eagle nest sites or winter roost sites were identified within the Dry Creek POD, the Dry Creek POD area may be used occasionally by bald eagles as foraging habitat. It is also expected that bald eagles may migrate through the POD area infrequently.

The potential for black-footed ferret habitat within the Dry Creek POD was also assessed. According to United States Fish and Wildlife Service (USFWS) guidelines for determining suitable black-footed ferret habitat (USFWS, 1989), a black-tailed prairie dog complex suitable to support ferrets is defined as an aggregation of two or more neighboring prairie dog towns separated by a distance of less than 4.34 miles and totaling 80 acres or more. The combination of black-tailed prairie dog burrow site density per acre and the acreage of prairie dog towns within the Dry Creek project area determined potential habitat for black-footed ferrets. Surveys for black-footed ferrets were conducted within the Dry Creek POD. No black-footed ferrets or their sign were observed during the surveys. (Hayden-Wing Associates, 2004) Black-footed ferret surveys have also been previously conducted within adjacent areas. Black-footed ferret surveys were conducted by Hayden-Wing associates on black-tailed prairie dog towns located 1 ½ miles to the northwest, 2 miles to the southwest, 2 ½ miles to the southwest, 2 ½ miles to the east, and 4 ½ miles to the east of the POD boundary. No black-footed ferrets or their sign were observed during the surveys.

Appendix B contains tables listing all T&E and BLM listed sensitive species thought to occur in Montana. These tables describe potential habitat and potential presence of a species within the project area. Inventories have not been conducted for the occurrence of all species listed,

although habitat information is from wildlife and plant inventories conducted in the area. Some sensitive species, such as sage grouse and prairie dogs, are discussed in more detail in sections 3.12.3-7.

3.12.2 Big Game Species

Surveys to specifically identify population estimates of big game were not conducted within the Dry Creek POD area. A spring survey was conducted 20 miles north of the Dry Creek area along 5-6 mile belts on both sides of the Northern Cheyenne Reservation boundary. This survey encompassed approximately 250 square miles and was designed to obtain mule deer (*Odocoileus hemionus*) estimates, although observations of other game species were also recorded. Within the survey area, the observed density of mule deer averaged approximately 1.0 per square mile (Mackie, 2004). Densities varied locally from less than 1.0 to 3.0 per square mile. Although conditions vary from this survey area to the Dry Creek project area, the population densities of mule deer are estimated to be comparatively similar. Mule deer are considered year long residents throughout the project area. All of the area within the Dry Creek project area is designated as mule deer crucial winter range.

Pronghorn (*Antilocapra americana*) are also found on valley floors and other areas of gentle topography with minimum slope. Pronghorn are common but considered less abundant than deer.

White-tailed deer (*Odocoileus virginianus*) use the Tongue River corridor and associated side drainages with preferred habitat. Within the Dry Creek project area, preferred habitat exists sporadically along Squirrel Creek, and white-tailed deer may use this area on occasion.

Previous BLM surveys indicate that elk (*Cervus canadensis*) can be found from the Tongue River along the state line east to the Badger Hills, and north into the Tongue River breaks continuing into the Custer National Forest. This general area starts east of the Dry Creek project area approximately 9 miles. Wildlife surveys within the Dry Creek project area have not identified elk as inhabitants, although elk may be transitory through the area.

Other big game species including black bear (*Ursus americanus*), mountain lion (*Felis concolor*), and moose (*Alces alces*) may occur in

the area, but BLM has no specific data at this time.

Large game mammal movements or migrations through this area are not fully understood. At a local level, it is reasonable to assume that large game, such as deer and elk move seasonally from areas of higher elevation into low elevation winter range along the Tongue River Corridor.

3.12.3 Upland Game Birds

The Dry Creek project area contains habitat for sharp-tailed grouse, sage grouse, and turkeys, however there are no “strutting grounds” or “leks” within the Dry Creek project area. Three sage grouse leks exist within two miles of the project boundary, two of which have been documented as being active. The BI-11 lek is located approximately 1.5 miles west of the nearest federal well. This lek contained 8 birds during one inventory in 2003 (BLM files). The BI-10A lek is located approximately 1.9 miles north of the nearest proposed federal well. This lek contained a maximum of 11 birds over five separate surveys in 2004 (Brett Walker, U of Montana, personal communication). The other lek (BI-12) was last reported as active in 1988, containing 4 birds (BLM files). This inactive lek has been surveyed at least once per year from 2001 to 2003. Some habitat exists to potentially support sage grouse nesting, brood-rearing, and winter range within the Dry Creek project area.

A sharp-tailed grouse lek (unknown activity) exists slightly northeast of the BI-10A strutting ground, just over 2 miles from the nearest federal well. Some sharp-tailed grouse habitat exists within the rougher topography and riparian areas within the Dry Creek project area.

Wild turkeys may also use some riparian and/or upland habitats within this area.

3.12.4 Raptors

The Dry Creek project area provides nesting habitat for various species of raptors. Several active and inactive nests have been identified within this area. Those species, which have had active nests within the last two years include great-horned owls (1, within 0.5 miles of Wells 12D,M,C-1990), red-tailed hawks (1), and golden eagles (1). Those nests/territories that have been inactive within the last two years include great-horned owls (1), prairie falcons (2), and red-tailed hawk (3). An active osprey nest is

also nearby, located approximately 1.8 miles from the nearest proposed federal well.

3.12.5 Prairie Dogs and Associated Species

The black-tailed prairie dog is a designated BLM sensitive species. Black-tailed prairie dog towns also provide potential habitat for several raptor species, BLM sensitive species (mountain plovers, burrowing owls) and endangered black-footed ferrets (BLM, 2004 (sensitive species list)). There are six black-tailed prairie dog towns within and continuing off the proposed Dry Creek project area. Approximately 500 acres of dog towns, ranging in size from 9.9 to 252 acres, are within the project area. Approximately 100 acres are located on either split estate (private surface/federal minerals), or federal surface/federal minerals within the project area. Approximately 10-15 of those acres are on surface administered by the BLM. The largest of these prairie dog towns is about 252 acres. Most of this prairie dog town is on private surface/private minerals, and is currently fragmented by previously authorized CBNG production (CX field) and associated facilities. Three other black-tailed prairie dog towns are also fragmented by existing facilities and/or the main access road.

Mountain plover habitat was identified within the largest prairie dog town in the Dry Creek project area. Hayden Wing associates have surveyed suitable habitat for mountain plovers for 3 consecutive years and have not reported any observations of mountain plovers within this area (Hayden Wing, unpublished).

Burrowing owls have not been observed within the Dry Creek project area.

3.12.6 Bird Species

The Montana Natural Heritage Program conducted baseline bird surveys and identified 104 species of birds as inhabitants of this portion of southeast Montana, and another 55 species as probable/possible inhabitants (Carlsen and Cooper, 2003). The BLM commissioned 2 separate breeding bird surveys (unpublished reports by USGS and University of Montana) in the project area and surrounding areas in 2001 and 2003. Species such as meadowlarks, lark/clay-colored/brewers sparrows, robins, rock wrens, and blackbirds were considered the most abundant species within and adjacent to the Dry Creek project area. Appendix B includes a summary of all Montana BLM bird species of

special concern, including analysis of potential habitat and possible occurrences of these species in the project area. These species are in very low numbers, and may not have been documented on recent surveys. These may include, but not limited to, ferruginous and swainson's hawks, hairy woodpecker, loggerhead shrike, and others (see Appendix B).

3.12.7 Fisheries/Aquatics

The Tongue River upstream of Tongue River Dam supports a major recreational fishery. Key species include smallmouth bass, sauger, and channel catfish. Fifteen fish species have been identified in the reach of river near the proposed project location (refer to <http://maps2.nris.state.mt.us/>).

There were 14 fish species identified in the river upstream of the Tongue River Reservoir (RM 200.7 to RM 206.7) through electroshocking in 2004. The sauger is the only sensitive fish species in Tongue River watershed, downstream of the project area. The Northern Leopard Frog, spiny softshell, snapping turtle, Plains spadefoot, Great Plains Toad are all sensitive aquatic dependent species that may occur near the project area. In addition to the above aquatic species, there are also other amphibians and aquatic invertebrates that are common in and along the Tongue River and many of its tributaries.

Macro-invertebrates, fish, periphyton, instream habitat, and riparian habitat were surveyed for existing baseline condition at two sites on the Tongue River (in between the reservoir and the state line) from July 26-27, 2004, (BLM preliminary data, 2004). These two sites are located on the Tongue River at the state line (T. 9 S., R. 40 E., S. 31) and Tongue River near the bridge (T. 9 S., R. 40 E., S. 27). Most of the above data is currently being analyzed and will not be available until March of 2005. Preliminary observations indicated a variety of fish, invertebrates, and amphibians. The summary determination for rating streams (BLM, 1998) indicated that the above sites surveyed were functioning at risk in an upward trend. The upward trend was evident through revegetating streambanks and new shrub/tree recruitment. The impacts that attributed to the functioning at risk rating were unstable streambanks and lack of riparian vegetation in some areas. Additional sampling for aquatic invertebrates was completed by the USGS on the

Tongue River at the state line (upstream of the reservoir) and the Tongue River at Brandenburg Bridge (approximately 85 - 95 stream miles downstream of the project area) in 2003. In fast-flowing habitats, the most abundant taxa for the site near Brandenburg Bridge were Ephemeroptera (49%) and Tricoptera (27%). The Tongue River at the State Line site consisted of Ephemeroptera (62%), Miscellaneous Diptera (aquatic flies) (12%) and Coleoptera (aquatic beetles)(11%).

Squirrel Creek is an intermittent/perennial (has perennial and intermittent reaches throughout its length) tributary to the Tongue River and flows within the boundaries of the Dry Creek POD. In 2002 and 2004, fish, macro-invertebrate, periphyton, instream habitat, and riparian habitat were surveyed for existing baseline condition (Confluence, 2003) (BLM preliminary data, 2004). The surveys were completed in the stream at the upstream end of the Dry Creek project boundary (T. 9 S., R. 39 E., S. 14 (NW¹/₄)) and the downstream end of the project boundary (T. 9 S., R. 40 E., S. 29) for approximately 500 meters in each location. The two sites are approximately 7 stream miles apart.

Upper Squirrel Creek Site: At the upper Squirrel Creek site; 18 creek chubs, 18 fathead minnows, 50 lake chubs, 5 longnose daces, and 3 white suckers were found during the July 23, 2002, survey. Six Northern leopard frogs and more than 100 crayfish were also found. Aquatic invertebrate data results had a taxa richness (measures the overall variety of the macroinvertebrate assemblage) of 33 to 36, the highest taxa richness of all the sites in the 2002 study area, and an impairment rating of slight to moderate. The conductivity was 1440 uS/cm and the sodium absorption ratio was 7.49. The stream was a highly meandering, narrow and deep channel, consistent with Rosgen's E channel classification (1996). This portion of channel was in excellent shape: ample undercut banks and occasional pools provided high quality habitat for fish in this section.

Only preliminary results are available for the May 26, 2004, upper Squirrel Creek Site. Fish species included two creek chubs, 48 fathead minnows, 15 lake chubs, and 34 longnose daces. One Northern leopard frog, 67 crayfish, 1 gopher snake, 1 garter snake, 1 blue heron, 1 leech, and beaver sign were present. No results are available for aquatic invertebrates. The

conductivity was 1510 uS/cm and the sodium absorption ratio was 1.23. This portion of channel was rated in Proper Functioning Condition with an abundance of riparian shrub/sedge vegetation: box elder, snowberry, juniper, green ash, plum, rose, golden current, sandbar willow, cottonwoods and sedges/rushes. Instream fish cover was rated over 50 percent. Some livestock use and a ford were present.

Lower Squirrel Creek Site: No fish were found at the lower Squirrel Creek site during the July 24, 2002, survey. Four crayfish were observed. Aquatic invertebrate data results had a taxa richness (measures the overall variety of the macroinvertebrate assemblage) of 18 (a considerable drop from the upstream site) and an impairment rating of moderate. The conductivity was 5790 uS/cm and the sodium absorption ratio was 48.73. The stream was a meandering channel, consistent with Rosgen's E channel classification (1996). This portion of channel had healing slumped banks.

Only preliminary results are available for the May 26, 2004, survey of the lower Squirrel Creek Site. Fish encountered included: 3 fathead minnows, and 1 lake chub. One northern leopard frog, 1 woodhouse toad, and 1 crayfish were found. No results are available for aquatic invertebrates. The conductivity was 5930 uS/cm and the sodium absorption ratio was 7.59. This portion of channel was rated Functioning at Risk with a trend that is not apparent. The stream has only a few riparian shrubs (snowberry, rose and wild plum), but does have a sedge/rush component. Streambanks are eroding. Instream fish cover was rated 10 to 30 percent. There is some livestock use and a culvert is located upstream.

As noted above, there is an increase in conductivity (over 4000 uS/cm in 2002 and 2004) and SAR (41.24 and 6.36 SAR in 2002 & 2004, respectively) between the two sites on Squirrel Creek. In 2002, invertebrate data indicated a reduction in taxa richness and a large decrease in fish numbers. In 2004, there was also a large decrease in fish numbers. The stream has not been analyzed to the extent needed to specifically identify the cause of the change in conditions between the upper and lower sites on Squirrel Creek (approx. 7 stream miles). However, based upon an analysis by Confluence Consulting, Inc., 2003, (Biological, Physical and Chemical Integrity of Select

Streams in the Tongue River Basin) and EA #MT-020-2003-0310 on the Fidelity Exploration CX Field – Fed. 22EM-2599, Fed#3, Fed#2 Wells, there is potential for Squirrel Creek to be impacted by impoundments (reservoirs) located within intermittent and ephemeral draws that flow into Squirrel Creek. The documentation also indicated that there is potential for CBNG water to be infiltrating through these impoundments, into the underlying alluvium, which would then flow into Squirrel Creek. These impoundments were constructed primarily for CBNG water storage during initial CBNG development in the area. On-channel livestock watering impoundments constructed prior to CBNG development. No on-channel impoundments are proposed for construction with this project.

Some of the water that would be produced by the project wells would be discharged into the Tongue River at existing discharge points between the reservoir area and the state line. Proposed CBNG discharge would be between 43 and 73 degrees F with a mean and median temperature of 62 degrees F. The water would meet state standards and guidelines (i.e. water temperature, EC, SAR, bicarbonate, ammonia, etc.) through using a mixing zone within the Tongue River Refer to 3.4 Hydrology for other water quality information.

Springs: The existing level of CBNG development would be anticipated to cause 16 springs to be included within the 20 foot drawdown contour over the next 20 years (See section 3.4.2). It is anticipated that various aquatic species and amphibians use these springs to rear and reproduce.

The existing conditions of Squirrel Creek and the Tongue River may have been affected by the following current and past activities: Decker Coal Mine, Spring Creek Coal Mine, Montana and Wyoming CBNG development, gravel/scoria pits, livestock grazing, agriculture/irrigation, Tongue River dam and reservoir, residential areas, existing roads and road reconstruction/maintenance. These actions occur in various degrees throughout the drainage which influences the degree at which aquatic life is affected. Water quality, erosion and streamflows are identified as parameters that could be changed or impacted and subsequently result in potential effects to aquatic life.

Coal Mining: Coal mining has the potential to affect water quality, erosion, and streamflows. This activity consists of 18,400 surface acres. This is equal to 0.5 % of the area within the Tongue River drainage (3,458,832 acres). The amount of water discharged into the Tongue River Reservoir from these mines is 3.74 cfs, which is approximately 5 percent of the flow at the low monthly 7Q10 (70 cfs) above the dam.

CBNG development: CBNG has the potential to affect water quality, erosion and streamflows. Currently, there is a discharge permit of 1600 gpm (3.56 cfs) for CBNG produced untreated water (approx. 5 percent of the flow at the low monthly 7Q10 (70 cfs) above the dam (this only includes Montana).

Livestock Grazing: Livestock grazing occurs over most of the project area. Potential impacts are increased erosion and higher stream temperatures from reduced riparian vegetation through livestock browse, livestock reservoirs that breach, and livestock trailing/loafing. The degree of the effect varies throughout the drainage and depends on the vegetation types, type of grazing system, topography, fencing, water, forage availability, and natural conditions.

Agriculture/irrigation: Potential impacts from agriculture/irrigation are decreased streamflows, changes in water quality and erosion. Agriculture is primarily limited to dry land farming or irrigated farmland adjacent to perennial streams and rivers. This area is limited primarily limited by terrain. The amount of flow removed from the Tongue may vary per day based on irrigation needs. However, the most impacted portion of the Tongue River from irrigation withdrawal is downstream of the T&Y diversion at 12 mile dam (approx. 165 miles downstream of the project area). The river is almost de-watered during a portion of the irrigation season. This can have an effect on spawning fish, such as the sauger, and affect the fish and aquatic habitat and populations within the river.

Tongue River Dam and Reservoir: The Tongue River Dam and Reservoir regulate the amount of water cubic feet per second (cfs) flowing downstream of the dam. As a result, flushing or high peak flows on the Tongue River do not always occur. These flows may be preventing the recruitment of cottonwood and other flushing flow dependant riparian species on the Tongue

River. In addition, Schmitz (2004) indicated that during dam reconstruction (which has occurred within the past decade) there were periods when no flow was permitted through the dam. There is a potential benefit to aquatics from the dam and reservoir. There could be less potential for erosion of streambanks from the lack of high peak flows.

Existing roads and road reconstruction and maintenance (including gravel/scoria pits): Roads have the potential to increase erosion, block fish passage (where culverts are installed) and remove riparian and upland vegetation. Road reconstruction and maintenance occurs at some level on all of the BLM, state, city and county roads within the drainage. The main effects from road (re)construction and maintenance are associated with erosion and in some cases decreased vegetation adjacent to the river/streams. However, in many cases road maintenance and reconstruction reduces the risk of erosion by preventing failures during high flood events.

3.12.8 West Nile Virus

West Nile Virus (WNV) is a mosquito-borne disease that can cause encephalitis and other brainstem diseases in humans and a major impact on vertebrate wildlife populations. WNV was identified as a mortality factor in a sage grouse population near Gillette, WY in 2003. This population is part of a research project evaluating CBNG development impacts to sage grouse populations in southeast Montana and northeast Wyoming. WNV is spread when mosquitoes feed on infected birds, and then people and other birds and animals. WNV is not spread by person-to-person contact and there is no evidence people can get the virus by handling infected animals.

Mosquitoes can potentially breed in any standing water that lasts for more than 4 days. Surface water availability has increased with CBNG development in the Powder River Basin, which includes the proposed project area. WNV has been identified in mosquitoes trapped in and around CBNG produced water reservoirs in the vicinity of the sage grouse mortalities (B. Walker, personal communication). Research on this issue is currently being conducted by several entities (WY Veterinary lab, University of Montana, Montana State University, USDA, and the University of Alberta).

Other factors that may be influencing WNV are the irrigation adjacent to the Tongue River, stock water reservoirs and troughs, natural wetlands and various environmental influences.